NAVAL POSTGRADUATE SCHOOL
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THESIS

ADVANTAGES OF APPLICATION OF ELECTRONIC COMMERCE IN PROCUREMENT FOR THE ARMED FORCES OF BRAZIL AND SOUTH KOREA

by

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December 2001

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I. INTRODUCTION

A. BACKGROUND

Adequate instruments and institutions exist for the establishment and maintenance of world order, but they have not been granted mandatory power to enforce the maintenance of international peace and security. Negotiation, inquiry, mediation, conciliation and arbitration are used in some situations. In others, use of force becomes necessary.

Each country structures its Armed Forces to ensure the safety and security of the nation, and in particular the preservation of the democratic institutions when the pacific instruments aforementioned fail.

Because of the absence of global conflicts since World War II, society has been questioning the volume of investments required to equip and maintain the Armed Forces.

Resources are always scarce and if not used to equip and maintain the Armed Forces during peacetime, they could be used for more attractive projects under the vision of the general public, like education, health, transportation, and housing.

1. Problem

The result of the decreased perception of the possibility of conflicts and demands from society has been reduced budgets for most of the Armed Forces around the globe. This context applies to both Brazil and South Korea. Notwithstanding, they still have to accomplish their mission should a necessity arise.

The terrorist attack on the U.S. on 11 September 2001 showed the entire world that there is a new type of war from an unexpected enemy. These wars characterize a new scenario described “as come as you are” wars and will probably have important implications in the future. The consequences for military expenditures around the world is uncertain, and more specifically, in Brazil and South Korea. Considering still that military budgets in Brazil and Korea will likely increase as a result of the terrorist attacks on U.S. soil, fast innovations in weapon systems are needed to replace aging systems as well as preparations to face chemical and biological weapons which will require strict control over military expenditures in both countries.

2. Proposed Solution

Pressure to reduce costs have encouraged the public sectors in Brazil and South Korea to reexamine how they manage, control and acquire the operating resources required to maintain daily business activities. Looking for new approaches to improve the effectiveness of accomplishing their missions with solutions such as reengineering, Total Quality Management (TQM), Just in Time (JIT), Outsourcing and Electronic-Commerce (EC) are incorporated into management strategies.

EC has been used successfully in the private and public organizations of developed countries, especially in the United States, Sweden, Finland, Norway and the Netherlands. (McDonald, 2001)

In the same manner as in the developed countries, the use of EC can be advantageous for the Armed Forces of Brazil and South Korea.

3. Consequences if Not Implemented

If the Armed Forces of Brazil and South Korea decide not to implement EC in their procurement activities, they will lose the opportunity to reduce costs and improve the readiness of its military organizations. Other advantages lost by keeping the traditional procurement system are discussed in the next chapter.

B. CURRENT MILITARY ENVIRONMENT

1. In the World

Notwithstanding the occurrence of isolated conflicts, the world has been experiencing a relative peaceful period and as a consequence, particularly with the end of the cold war, expenditures in military related items for most of the nations have decreased. According to the USA Department of State (1996), global military expenditures decreased 30% in the 1990s, and nearly 50% compared to the peak of the Cold War (1985). The 1985 to 1995 figures for some countries exemplifies the reduction in relation to the GDP: United Kingdom 5.1% to 3.0%, France 4.0% to 3.1%, Italy 2.2% to 1.8%, Belgium 3.1% to 1.7%, Spain 2.4% to 1.6% and in the US 6.1% down to 3.8 %. Manpower changes have seen as drop of 10% in France to 56% in Belgium. (See Table 1) (USA State Department, 1996)

	Year	Military Expenditures (ME) in million (constant) dollars except for the world	Armed Forces (Thousands)	GDP Billion Dollars (constant)	ME/GDP (%)
World	1985	1330.8(billion)	28,070	25,370	5.2
	1990	1270.6(billion)	27,740	29,670	4.3
	1995	864.5(billion)	22,790	30,960	2.8
Country					
U.K.	1985	45,850	334	894,600	5.1
	1990	42,630	308	1,037,000	4.1
	1995	33,400	233	1,110,000	3.0
France	1985	48,990	563	1,226,000	4.0
	1990	51,480	550	1,438,000	3.6
	1995	47,770	504	1,521,000	3.1
Italy	1985	19,460	504	881,900	2.2
	1990	22,010	493	1,019,000	2.2
	1995	19,380	435	1,082,000	1.8
Belgium	1985	6,688	107	216,600	3.1
	1990	6,155	106	252,100	2.4
	1995	4,449	47	269,100	1.7
Spain	1985	10,060	314	415,300	2.4
	1990	9,633	263	518,700	1.9
	1995	8,652	210	553,800	1.6
US	1985	353,800	2,244	5,758,000	6.1
	1990	351,900	2,181	6,625,000	5.3
	1995	277,800	1,620	7,247,000	3.8

Table 1. Military Expenditures, Armed Forces, GDP, % of ME/GDP.
(After: USA State Department, 1996)

The share of military expenditures is higher only where a de-facto military confrontation that can instantly flare into an armed conflict could occur in countries such as Greece, Turkey, Israel, Saudi Arabia, Kuwait, and Taiwan, for example. (Obozreniye, 2001)

2. In Brazil

The Federative Republic of Brazil, the largest and most populous country in South America and the fifth largest in the world, has been peaceful for more than fifty years. The country, which during military intervention was considered a threat – Argentina – is now an important ally and partner in the Mercosur (Common Market of

the South). In fact, the two countries have never been as close as today, with many initiatives being undertaken to improve relationships in the military, education, culture, and economic affairs. An example of this is the common practice of studying the language of a neighboring country as a second language, to perform joint military operations and to share ideas in the decision making process in the international scenario concerning issues that influence South America.

The total active manpower of the Brazilian Armed forces is approximately 296,000 compared to 496,000 in 1985. Military expenditures stand at 1.8 % in relation to the GDP. (USA Bureau of Verification and Compliance, 2000) Regardless of a slight increase in the military budget in Brazil, its Armed Forces have been pressured to decrease its expenditures in order to allocate resources for investments in the areas of nuclear propulsion for submarines, the construction of conventional corvettes and submarines, the acquisition of modern aircraft and, recently, the acquisition of the aircraft carrier "São Paulo" (former "Foch") from the French navy.

The strategic focus of Brazil has shifted from the protection of the country's land borders to the Amazon region.

3. In South Korea

The People's Republic of Korea (DPRK) is bordered in the east by the East Sea, in the west by the Yellow Sea, and in the south by the Korea Strait, which separates it from Japan.

The defense structure and military alliance partners of the Republic of Korea are a result of the Korean War (1950 to 1953) and continuing tension with the DPRK to the north. (Periscope Agency, 2001a)

During an unprecedented summit meeting in Pyongyang on June 13-15, 2000, South Korean President Dae Jung Kim and North Korean leader Jong II Kim agreed to work towards a reconciliation and eventual reunification of the Korean peninsula.

The total active manpower of the South Korean Armed forces is approximately 683,000. Military expenditures in relation to the GDP have decreased during the last ten years from 4.2 to 3.4 %. The North Korea Armed Forces numbers 1,100,000 and the

military expenditures in relation to the GDP increased slightly during the last ten years from 20.3 to 21.3 %. (USA Bureau of Verification and Compliance, 2000)

In spite of recent improvements in the relationship between South and North Korea, it will take a long time to end the differences between the capitalist and the communist countries. In fact, in 1999, South Korea has put its armed forces on high alert after its navy sank a North Korean gunboat in the Yellow Sea as a consequence of the dispute over fishing rights in disputed waters adjoining the buffer zone between the two countries, and in January 2001, the country announced it would develop missiles capable of striking anywhere in North Korea, despite international fears of a new missile race on the peninsula. (Periscope Agency, 2001a)

As one of the six dragons of East Asia, South Korea has achieved a record of growth. Three decades ago, its GDP per capita was comparable with levels in the poorer countries of Africa and Asia. Today its GDP per capita is seven times India's, 13 times North Korea's and comparable to some economies of the European Union. (Periscope Agency, 2001a) Still, the country suffered because of the currency crisis in 1997 and its defense budget has been growing at a decreasing rate, from 12.7% in 1997 to - 0.3% in 1999. (See Figure 1) (Korea MND, 2001) The defense outlays per government budget decreased from 22.2% in 1995 to 17.4% in 2000; and per GDP also have decreased from 3.2% in 1997 to 2.9% in 2000.

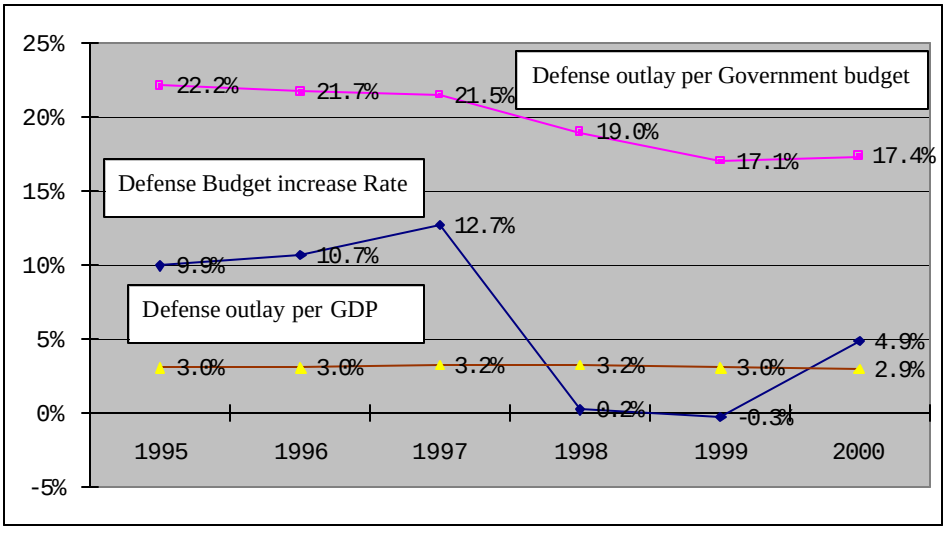

Figure 1. Korea Defense Budget Increase Rate by FY.
(After: Korea MND, 2001)

C. COMMON CHALLENGES TO BRAZIL AND KOREA

No matter what the differences in the military scenario between Brazil and South Korea are, both countries have been tailoring their force structure to meet the changed security threats in recent years and to fulfill its role: guarantee sovereignty while preserving the Nation's territorial integrity heritage and interests; guarantee the rule of law and democratic institutions; maintain the nation's cohesion and unity; protect individuals, goods and resources under their jurisdiction; achieve and maintain the interests abroad; have a significant role in international affairs and in the international decision-making process; and contribute to the maintenance of international peace and security.

The economic situation in both Brazil and Korea is similar and both countries face similar problems: dependency on massive foreign borrowing, devaluation of their currencies in relation to the American dollar, and high debts.

Both countries do not have strong military industries, and rely on imports from the United States, France, Italy, Sweden, Germany, France and Russia to supply most of the weapon systems. Since the budget is not prepared in American dollars or another strong currency, it is necessary to reduce internal expenditures to continue acquisitions and modernization of the existing systems, as a consequence of this currency devaluation.

D. REQUIREMENTS OF THE BRAZILIAN AND KOREAN ARMED FORCES IN THE NEW SCENARIO

Both Brazil and the South Korean Armed Forces must be prepared to fight and win in a new scenario characterized by conflicts described as "come as you are" wars, meaning that there will be little lead time for the mobilization or surge of production capability. They will require rapid transportation, flexible maintenance support, and greater reliance on private sector suppliers. (USA DoD, 1996)

The new conflicts will be technology intensive. Technology has improved lethality, precision and mobility. Hence, victory will require a dominant flow of information and communication. As war fighting scenarios have changed, so too have attendant support functions.

Among the requirements, these new scenarios require solutions that bring about improved readiness and cost savings for the Armed Forces of Brazil and South Korea.

1. Readiness

Readiness means ready for immediate use. This aspect is fundamental to the Armed Forces, since it is sometimes difficult to predict the emergence of armed conflicts and most nations have not been engaged in conflicts since World War II. Readiness is a dynamic process that needs to be assessed by exercises that simulate war fighters in the conditions of a conflict. Exercises are important to assess not only the aspects in the field, but also the degree of support from organizations whose missions are to maintain the Armed Forces.

Readiness is an investment process. It encompasses attracting human resources to accomplish the mission, and investing in equipment, maintenance, infrastructure, spare parts, and technology so that equipment will be ready when needed. It also involves the training of tactics, techniques and procedures. The importance of readiness is in preparing the Armed Forces so that they remain continuously ready to answer the nation's call.

The requirements are not the same for all countries. In the United States, for example, readiness involves being able to engage in and to fight and win two near simultaneous major theater wars. (USA DoD Office of Assistant Secretary of Defense, 1998)

At the joint level, that is an investment and development process so that it all comes together and works together effectively. Most importantly, when thinking about readiness, is the necessity to provide the right support at the right time and at the right place.

Because modernization today is tomorrow's readiness, it is necessary to balance the critical elements of near term readiness versus the modernization funds that are required to upgrade the existing systems.

The success in the missions of conducting forward presence, peacetime engagement, deterrence operations, and timely crisis response depends on both capability and credibility. Credibility hinges on being able to sustain this capability by supporting

the forces effectively in peace and war. Such support is an important indicator of combat readiness. (USA DoN, 1995)

2. Cost Reduction

Few countries, as mentioned earlier, have had its Armed Forces' budget increase in the last years. In an environment of shrinking budgets, downsizing is the order of the day. It is more reasonable to expect that the following budget will be almost the same as that of the previous year, and sometimes some extra resources are allocated to compensate for inflation. This scenario has been characteristic of the military budgets of both Brazil and South Korea. Resources for investments have already been reduced and updating the existing systems has been used to keep the Armed Forces equipped. This solution, correct in the short term, will not work for the future. It will be necessary to invest in new defense weapons in the long run, and alternatives must be found for the present.

The fact that many acquisitions take place in foreign countries also creates a problem for nations that continuously experience the devaluation of their currencies. Inflation is relatively under control in Brazil and Korea, but it still affects a fixed budget.

Defense spending can be broadly divided into three main parts: personnel costs, equipment costs and running costs.

The shift away from conscripts and reserves prepared to defend national territory, towards well-trained professional militaries ready for anything continues everywhere. As a consequence, equipping and manning the Armed Forces becomes more difficult.

Wages are a big portion of military expenditures and it is usually difficult to pay such low salaries and retain the type of manpower that is needed within the services. The fast changing technologies require personnel who are more technically able, and thus more expensive. Legislation also makes the payroll bigger each year because wages usually increase with promotions, service time and the specialization.

The cost of military equipment is also great. Surprisingly, sometimes computers for military applications and other high technology equipment have not experienced similar decreases in price and increases in the capability seen in the commercial computer industry and in consumer appliances. There are three reasons why this effect will not

happen. Production runs are very short, and often spread out over a long period of time. The technologies are very specific to military usage, and have little application beyond that. The period of time from conception to deployment is typically 10 to 20 years and it is difficult to take advantage of technology innovations that change at a much faster rate. (Kaminski, 1997)

The life expectancy of a particular item is often a matter of choice, and may be determined by budgetary pressures. Usually, equipment costs much more than their predecessors because of innovations. The choice of stretching the life expectancy is always connected to the higher cost in maintenance.

Since the Armed Forces cannot decrease costs in wages and equipment, pressure to reduce costs is concentrated on support costs, which includes items such as fuel, parts, food, transport, office material, maintenance and logistics services.

To achieve cost reductions, the Armed Forces have been implementing techniques used in the private sector that do not decrease readiness.

E. TOOLS AVAILABLE TO CONTROL COSTS AND IMPROVE READINESS

E-commerce (EC) has been responsible for providing efficiency and savings both in time and money, primarily in the private sector. By increasing the response to needs and decreasing intermediation, EC can also help to improve readiness, among other advantages that will be presented in the following chapter.

EC will not only provide the necessary improvements but basic business processes must also be modified if the Armed Forces from Brazil and Korea are to benefit from paperless operations. The Armed Forces from both countries must eliminate unnecessary steps by using IT.

Presently, in Brazil and Korea, the traditional acquisition process is bureaucratic, time consuming and paper based, and does not meet the needs of the future. The procedures that are currently accomplished manually via a paper process, such as clauses, provisions, certifications, and representations, must be redesigned to maximize the use of EC methods.

EC is not new. Commerce has been conducted with the use of electronic devices for more than 150 years. The telegram and the telex are examples of such devices. Nowadays, the use of the Internet and the World Wide Web has been rapidly assimilated into the business sector. By the year 2004, it is expected to rise to over 4 trillion users. Common sense dictates that if EC can work well for the private sector, why not trying using it in the government?

II. ELECTRONIC COMMERCE

A. DEFINITION

EC can be defined as the process of doing business electronically and it involves the automation of various transactions via the Internet and the World Wide Web. (Laudon, and J. P, 1997) As most restrictively defined, EC is the buying and selling of goods and services, and the transfer of funds through digital communications. However, EC also includes all inter-company functions, such as marketing, finance, manufacturing, selling and negotiation, that enable EC and the use of e-mail, EDI, file transfer, fax, video conferencing, workflow, smart cards, digital cash or interaction with a computer.

B. ADVANTAGES

As summarized in Table 2, EC can offer several opportunities to suppliers and commensurate benefits to the Armed Forces of Brazil and South Korea.

Cost Savings	Price Reductions
Global Presence	Global Choice
Shorten or Eradicate Supply Chains	Rapid Response to Needs
Improved Competitiveness	Increased Control of Inventories
Lower Costs in Advertisements	High Level of Support
Mass Customization	Personalized Products & Services

Table 2. EC - Opportunities and Benefits.

Many of the benefits are related, making it difficult to limit them. Among other benefits, EC can provide the following.

1. Cost Savings for Vendors and Price Reductions for the Armed Forces

By reducing clerical procedures and eliminating paper handling, EC can reduce operating and inventory costs. Keeping in mind that a vendor is usually also a buyer (a depot or military shipyard rendering services for other military organizations), imagine that a military unit uses a large quantity of complex printed circuit boards (PCB).

Purchases can involve a wide variety of electronic components from a large number of suppliers. One type of PCB assembly has more than 2,500 electronic components with varying lead times and unit costs. Buyers in the purchasing function spend a considerable amount of time in transaction activities such as order planning, expediting and resolving supply problems for many of these components, with time spent on low value commodity components. Imagine the benefits if the military organization shared information with key suppliers that would deliver items based on automatic reorder levels.

It also becomes cheaper for the vendor to reduce prices with savings obtained in rentals and fancy stores since by using EC, a company does not need to open stores in cities or counties to reach the public of that specific city or county.

Web-based commerce creates the possibility of eliminating the middleman. The buyer can order directly from the manufacturer instead of paying overhead for others.

The experience of the early participants in the EC suggests that an electronic marketplace can capture savings of 10 percent to 20 percent and deliver lower prices to buyers. (Harrington, Layton, and Rerolle, 1998)

The US Navy had planned to spend more than $ 3 million over five years on a contractor who could transport the personnel effects of military personnel back and forth between Hawaii and Guam. But as a result of a reverse auction through eBreviate, an Electronic Data Systems, they will pay just $ 2.1 million, a savings of about 30 percent. (Terry, 2001)

Delphi Automotive, Owens Corning, and United Technologies have saved more than 15%, on average, buying parts, materials, and even services at *FreeMarkets.com.* Pennsylvania cut 10% or so off its expenditures for aluminum for license plates and coal for heating state buildings. Detailed data (Tully, 2000) about the savings with Freemarket.com are presented in Table 3:

Item	Buyer	Expected Outlay	Actual Outlay
Semiconductors, metal stampings, et al.	Delphi Automotive	$420 million Yearly total	360 million
Packaging materials et al.	Owens Corning	$129 million Yearly total	120 million
Circuit boards	United Technologies	$74 million	$42 million
Aluminum	Commonwealth of Pennsylvania	$2.8 million	$2.5 million

Table 3. Savings Generated by the Use of EC.
(After: Tully, 2000)

2. Global Presence and Global Choice

The boundaries of EC are not defined by geography or national borders, but rather by the coverage of computer networks. Since the most important networks are global in scope, EC enables even the smallest suppliers to achieve a global presence and to conduct business worldwide.

The corresponding buyer benefit is global choice. The military organizations can select from all the potential suppliers of a required product or service, regardless of their geographical location.

3. Shorten or Eliminate Supply Chains and Provides Rapid Response to Needs

EC often allows traditional supply chains to be shortened. There are many established examples where goods are shipped directly from the manufacturer to the end user by-passing the traditional staging posts of a wholesaler's warehouse, retailer's warehouse or retail outlet.

An extreme example arises in products and services that can be delivered electronically with the supply chain being eliminated entirely. This has enormous implications for the entertainment industries, information and educational industries, and for companies concerned with the development and distribution of computer software.

The corresponding benefit to the Armed Forces is increased readiness derived from the ability to rapidly obtain the product required without being limited to those currently in stock at local suppliers.

4. Improved Competitiveness and Increased Control of Inventories

EC increases opportunities for lower prices for the military organizations because of the availability of a larger number of virtual places to search and the ease of said search, and thus increasing competition among vendors.

On the vendor side, a business can reduce the costs of handling sales inquiries, providing price quotes, and determining product availability by using EC in its sales support and order-taking processes.

EC accelerates ordering, delivery, and payment for goods and services. Accuracy in exchange information is also improved, which reduces costs on both sides of transactions.

EC gives two-way communication of real-time financial and purchasing information without the need for middleware or value added networks. Management at both the buying and selling ends can monitor what is happening at any given moment and identify trends and problems. (McIvor, 2000)

EC makes it possible for businesses to shorten the purchasing cycle, which enables them to maintain lower inventory levels and respond more quickly to stock-outs. A great deal of money is invested in goods for military depots that become useless when weapon systems are replaced by new technologies.

5. Reduced Costs in Advertising and Support

Advertising done well on the Web can reach potential customers in every country in the world and increase sales. It is usually cheaper than ads on TV, in magazines and newspapers and other related media, and allows a company to reach narrow market segments that are geographically scattered.

It is an easy and cheap way to provide information to consumers, and particularly information that is dense or takes a lot of space or time to communicate.

The Web helps in creating virtual communities that become ideal target markets for specific types of products or services. A virtual community is a gathering of people who share a common interest, but instead of this gathering occurring in the physical

world, it takes place on the Internet. For example, anyone can buy a book from *Amazon.com* anywhere, anytime. If it were not for EC, this would not be possible.

Aside from advertising, a customer can obtain support from a Web site. People usually lose manuals. Many companies employ EC technology to offer improved levels of pre-and post-sales support, with increased levels of product information, guidance on product use, and rapid response to customer inquiries.

6. Mass Customization and Personalized Products and Services

With electronic interaction, vendors are able to gather detailed information on the needs of each individual customer and automatically tailor products and services to those individual needs. The advantage for the Armed Forces is customized products comparable to those offered by specialized suppliers but at mass market prices.

C. DISADVANTAGES

1. Not Applicable to Some Types of Goods

Some business processes may not lend themselves to EC. For example, high-cost items such as jewelry and antiques cannot be inspected adequately from a remote location, regardless of any technology that might be devised in the future. In the Armed Forces, EC is not appropriate for the acquisition of most new weapon systems. Decisions regarding the acquisition of weapon systems are based on trust, tactical specifications, and access to confidential data. Reliability and easy access to parts are always important considerations.

2. Frauds

Some people are afraid of sending confidential information online, regardless of the existence of security mechanisms. The number of fraudulent transactions is high in credit cards companies, banking transactions, and in the purchase of goods that are not delivered. Notes regarding the invasion of hackers in apparently protected sites are routine, which contributes to people being concerned about online transactions.

The military organizations face similar risks. The use of EC can expose these organizations to risks related to the use of purchase cards and electronic funds transfer.

3. Uncertainties

Not only businesses but military organizations as well often calculate return-on-investment numbers before committing to any new technology. This has been difficult to

do for investments in EC since the costs and benefits have been hard to quantify. Costs, which are a function of technology, can change dramatically during even short-lived EC implementation projects because the underlying technologies are changing rapidly.

Another problem is the difficulty of integrating existing databases and transaction-processing software designed for traditional commerce with the software that enables EC.

The legal environment in which EC is conducted is full of unclear and conflicting laws. In many cases, government regulations have not caught up with technologies.

4. Cultural Aspects

Some consumers are resistant to change and are uncomfortable viewing merchandise on a computer screen rather than in person. Some senior officers are not familiar with the use of IT and are reluctant to use EC, fearing that confidential information stored electronically in their organizations can become vulnerable.

5. Require Investments

The technology in the IT arena changes quickly and the decision to engage in the process of EC will probably require investments in hardware, software, and training. In some aspects, with unclear outcomes expected, the decision to implement EC removes resources for other military investments.

6. Shipping costs

In conventional commerce, in many circumstances, customers deliver the goods, which is impossible online with a physical good. This disadvantage is more important to individuals than for the military organizations, but in some circumstances, pressured by time, military personnel buy in the traditional way, especially for small purchases.

D. CURRENT STATUS

1. The Internet

The Internet makes it possible to expand EC around the world. The Internet is a global network connecting millions of computers. The art of estimating how many are online throughout the world is an inexact one at best. Surveys abound, using all sorts of measurement parameters. According to NUA Internet Surveys (2001), there were 513.41 million Internet users worldwide as of August 2001 (Table 4) - up from less than 160 million Internet users at the end of 1998. More than 100 countries are linked into

exchanges of data, news and opinions. The U.S. had over 166 million Internet users or nearly 33% of the total by August 2001. South Korea had 22.23 and Brazil 11.94 (Figure 2). In August 2001, sixteen countries had almost 85% of the total number of Internet users in the world, six of them with more than 50% of its population connected: the United States, the United Kingdom, Taiwan, Australia, the Netherlands, and Sweden (Figure 2). Most of the recent Internet user growth occurs in Asia, Latin America and Eastern Europe. A great deal of growth also occurs from wireless Internet use via web cell phones and this will be especially important in Asia.

There will be about 673 million Internet users worldwide at the end of 2002 and over 1 billion users by the end of 2005. The United States will grow to over 214 million Internet users in 2005, or 32% of the number of Internet users worldwide. (Computer Industry Almanac Inc, 2001)

Unlike online services, which are centrally controlled, the Internet is decentralized by design. Each Internet computer, called a host, is independent. Its operators can choose which Internet services to use and which local services to make available to the global Internet community. Remarkably, this anarchy by design works exceedingly well which in turn helps EC expand immeasurably throughout the world.

Region	**Number of Internet Users**	**As % of total**
Africa	4.15	0.81%
Asia/Pacific	143.99	28.05%
Europe	154.63	30.12%
Middle East	4.65	0.91%
Canada and USA	180.68	35.19%
Latin America	25.33	4.93%
World Total	513.41	100.00%

Table 4. Number of Internet Users around the World by Regions in August 2001. (From: NUA Internet Surveys (in million), 2001)

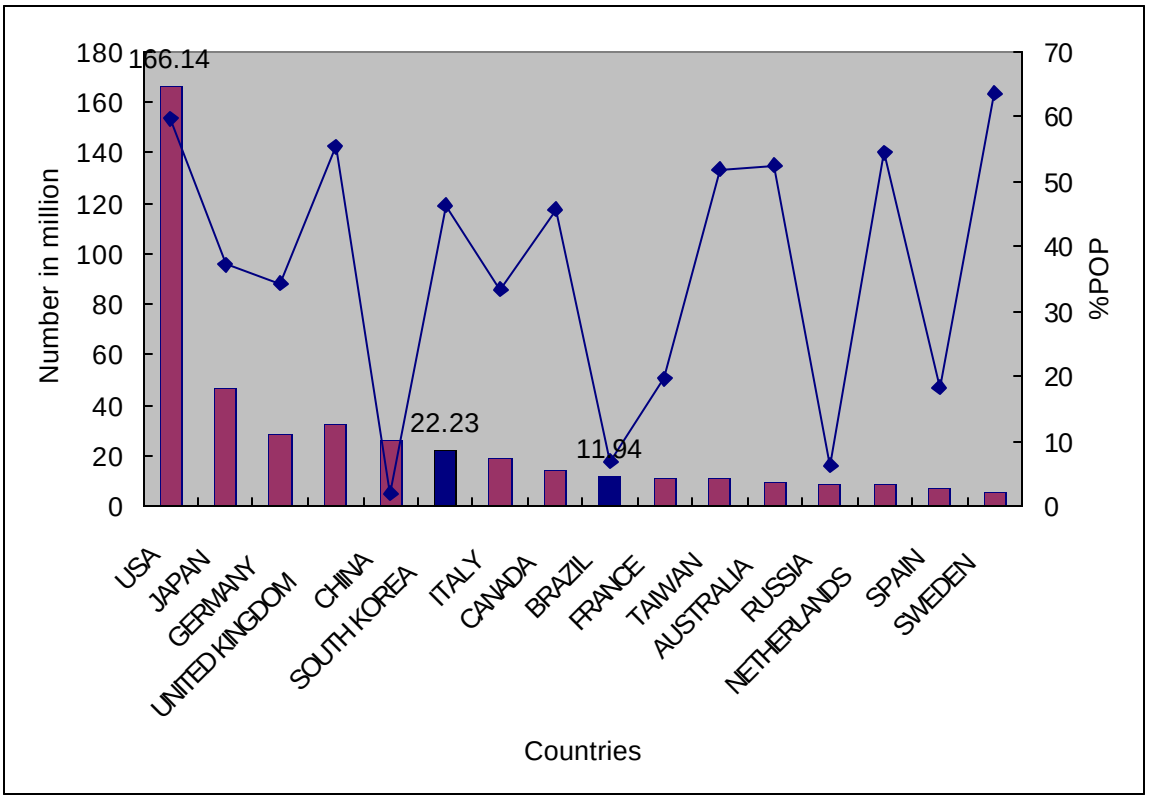

Figure 2. Number of Internet Users by Countries and as a Percentage of Population in August 2001.
(After: NUA Internet Surveys (in million), 2001)

2. The Increased Use of EC

With the increase of the use of the Internet, the population using EC is also increasing. The global Internet trade will reach $6.8 trillion in 2004 (Computer Industry Almanac Inc, 2001) (Figure 3). The emerging EC market means opportunities for countries. Therefore, to seize the emerging new market, governments compete eagerly. While countries move online at their own pace, their collective EC activities will be enormous, amounting to 8.6% of the global sales of goods and services in 2004 (Computer Industry Almanac Inc, 2001), as seen in Table 5.

Some countries are stimulating the growth of EC. The EC leader, the United States, invested six million dollars in the nonprofit organization 'CommerceNet', which studies EC, by developing, testing a new electronic payment system, and leading the creation of international standards in EC technologies.

In Japan, non-government organizations promote 10 EC projects, with the Japanese government supporting them in terms of funds. The Japanese government also invests in Smart Island Consortium (SIC), lead by 64 non-government enterprises, such as Nippon Tele Type (NTT), to activate EC.

G7 countries are also trying to improve EC infrastructure in their countries by participating in Ultra High-speed Information Communication projects.

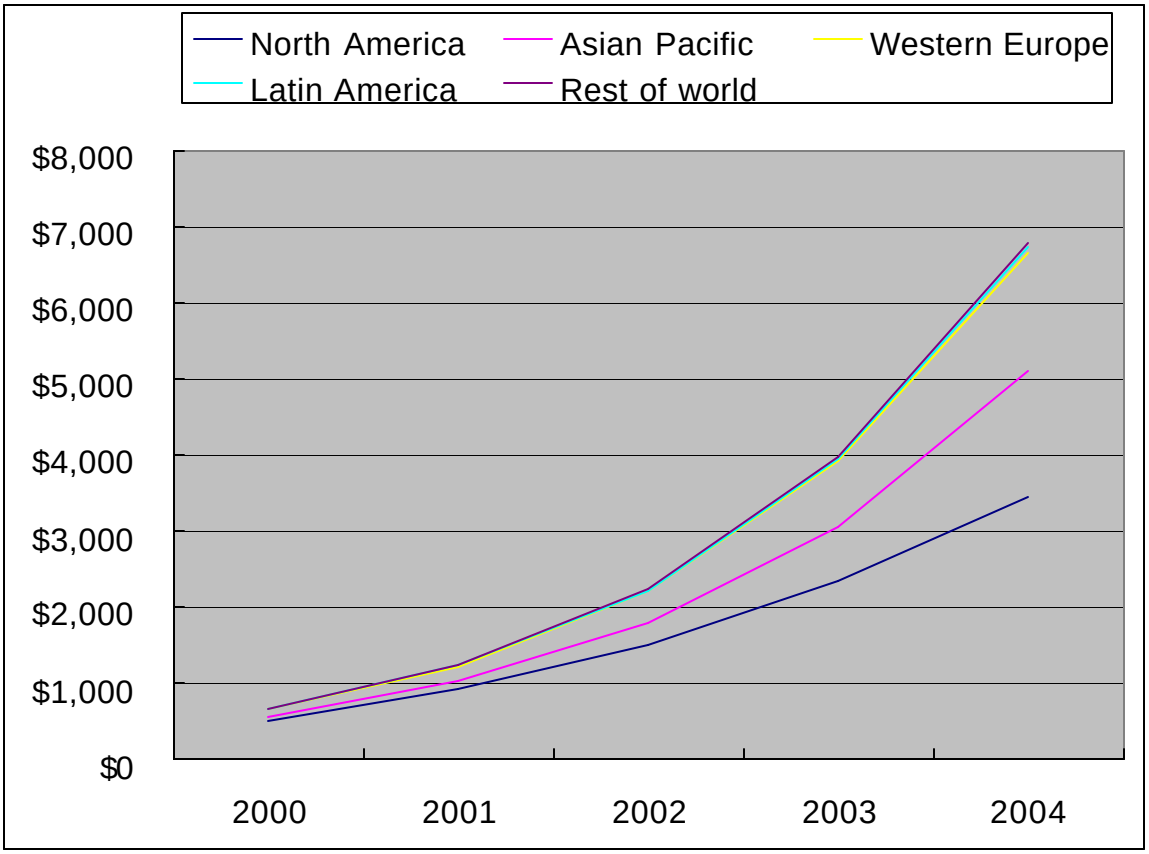

Figure 3. Cumulative Internet Expenses in Goods and Services by Regions from 2000 to 2004 (in US$ billion).
(From: Computer Industry Almanac Inc., 2001)

	2000	2001	2002	2003	2004	% of total sales in 2004
Total (billions US$)	**$ 657.0**	**$ 1,233.6**	**$ 2,231.2**	**$3,979.7**	**$6,789.8**	**8.6%**
North America	**$ 509.3**	**$ 908.6**	**$ 1,495.2**	**$ 2,339.0**	**$ 3,456.4**	**12.8%**
UNITED STATES	$ 488.7	$ 864.1	$ 1,411.3	$ 2,187.2	$ 3,189.0	13.3%
CANADA	$ 17.4	$ 38.0	$ 68.0	$ 109.6	$ 160.3	9.2%
MEXICO	$ 3.2	$ 6.6	$ 15.9	$ 42.3	$ 107.0	8.4%
Asian Pacific	**$ 53.7**	**$ 117.2**	**$ 286.6**	**$ 724.2**	**$ 1,649.8**	**8.0%**
JAPAN	$ 31.9	$ 64.4	$ 146.8	$ 363.6	$ 880.3	8.4%
AUSTRALIA	$ 5.6	$ 14.0	$ 36.9	$ 96.7	$ 207.6	16.4%
KOREA, REPUBLIC OF	$ 5.6	$ 14.1	$ 39.3	$ 100.5	$ 205.7	16.4%
TAIWAN	$ 4.1	$ 10.7	$ 30.0	$ 80.6	$ 175.8	16.4%
ALL OTHER	$ 6.5	$ 14.0	$ 60.6	$ 130.5	$ 197.1	2.7%
Western Europe	**$ 87.4**	**$ 194.8**	**$ 422.1**	**$ 853.3**	**$ 1,533.2**	**6.0%**
GERMANY	$ 20.6	$ 46.4	$ 102.0	$ 211.1	$ 386.5	6.5%
UNITED KINGDOM	$ 17.2	$ 38.5	$ 83.2	$ 165.6	$ 288.8	7.1%
FRANCE	$ 9.9	$ 22.1	$ 49.1	$ 104.8	$ 206.4	5.0%
ITALY	$ 7.2	$ 15.6	$ 33.8	$ 71.4	$ 142.4	4.3%
NETHERLANDS	$ 6.5	$ 14.4	$ 30.7	$ 59.5	$ 98.3	9.2%
ALL OTHER	$ 25.9	$ 57.7	$ 123.4	$ 240.8	$ 410.8	6%
Latin America	**$ 3.6**	**$ 6.8**	**$ 13.7**	**$ 31.8**	**$ 81.8**	**2.4%**
BRAZIL	$ 2.4	$ 4.8	$ 10.1	$ 24.2	$ 64.0	3.5%
ALL OTHER	$ 1.2	$ 2.0	$ 3.6	$ 7.6	$ 17.8	1.4%
Rest of world	**$ 3.2**	**$ 6.2**	**$13.5**	**$ 31.5**	**$ 68.6**	**2.4%**

Table 5. Internet Expenses by Regions from 2000 to 2004 and as a Percentage of Total Expenses in Goods and Services by Regions and Some Countries (In US$ Billion) (After: Forrester Research Inc., 2001)

3. Success Stories

a. Federal Express (http://www.fedex.com)

Federal Express (FedEx) delivers 2.5 millions freight orders to 211 countries every day. The on time delivery rate reaches 99 percent. (Schneider and Perry, 2001) FedEx has been using EC technologies for over 10 years. In 1995, FedEx distributed a package-tracking software, FedEx Ship, free of charge to anyone who wanted it. Once installed on the customer's computer, the software dialed the FedEx computer using a modem, queried the status of the customer's package, and displayed the results on the customer's computer. With the Web in full swing in 1997, FedEx has now

eliminated client-machine software and made package tracking available on its Web site. In 18 months, 75,000 people used this service. From the linked 5,000 web sites on the FedEx home page, package-tracking requests increases to several hundred thousands each month. The companies using FedEx provide their online customers with delivery condition verification services. Through Web based technologies, FedEx reduced its package-tracking costs and enhanced accessibility to their home page.

b. Cisco Systems (http://www.cisco.com)

Cisco sells almost all of its computer equipment through its Web site. Since no customer service representatives are involved in making these sales, Cisco operates very efficiently. In 1998, when 72 percent of its sales were on the Web, Cisco estimated that it avoided handling 500,000 calls per month and saved $500 million in that year alone. (Schneider and Perry, 2001)

c. Dell Computer (http://www.dell.com)

Founded in 1984 as a mail-order catalog business, Dell's business model was to sell made-to-order computers directly to the customer. Dell took their thriving offline business and turned it into an EC phenomenon, generating more than $30 million in sales through their Web site each day. Dell's Web site sells custom-configured computers to individuals and businesses by using technology-enabled supply chain management to give customers exactly what they want. It has reduced the amount of inventory it keeps on hand from three weeks' sales to six days' sales. Its Web site is logically organized by customer category and easy to use. (Deitel and Nieto, 2001)

Dell measures inventory levels in minutes. By increasing the amount of information it has about its customers, Dell has been able to reduce the amount of inventory it must hold. Dell has also shared this information with members of its supply chain.

In spite of the increase of the sales, Dell reduced customer service, sales, and marketing costs.

4. Toward EC in Brazil and Korea

Both governments have been trying to enhance private EC technologies and implement them in the public workplace.

The numbers involving EC are very difficult to quantify, but according to consulting groups and surveys, EC in Brazil increased from US$ 77 million in 1999 to US$ 379 million in 2000, with more than 8 million Internet users registered in 1999. (Bretthauer, 2001)

The expansion of EC in Brazil has been driven by the private sector. The thinking is that the private sector must continue to lead, and that the government should support the efforts of the private sector to develop mechanisms to facilitate the successful operation of the Internet.

A barrier to the implementation of EC in Brazil was the telecommunications infrastructure. A few years ago the Government broke the monopoly and opened markets to foreign investments. Services are still expensive, bandwidth is limited, and services are unreliable, but progress can be seen and this will not be a problem in implementing a networked society in Brazil in the coming years.

Consumers in Brazil are using the Internet primarily for buying books, computers and related products, compact disks, travel services and clothing.

It is expected that 90% of the big companies in Brazil will have more than 50% of their commercial transactions online. Nowadays, 35 % of them are already using the Internet in their operations. (Info Online magazine, 2001)

The B2B in 2001 is expected to be around US$ 5.9 billion, with predictions of US$ 46 billion in 2004. (Info Online magazine, 2001)

Brazil has an estimated 307 EC sites or 73 percent of the total for Latin America, despite a lower per capita income relative to its Latin American contemporaries, Mexico and Argentina. (Bretthauer, 2001)

Technologically advanced financial institutions provided the first Internet options to consumers through home banking.

The Government has been giving priority to the use of the Internet as a tool to improve the quality of services provided to its citizens. Many official sites have been launched recently. The use of reverse auctions has been tested through the official

Brazilian Bank. The Armed Forces have been using the Internet to inform citizens about ways to enlist in the services, and to give easily inform the general public of its activities.

The use of EC is expected to increase at a high rate with the incentive of allowing organizations to use reverse auctions. The traditional way of purchasing involves a lot of bureaucratic activities that vary with the volume of expenditures. By contrast, the military organizations will be able to use reverse auctions independently of the amount involved.

In Korea, private EC is developing. Private companies try to establish E-markets and compete with each other. The Ministry of Commerce, Industry and Energy (MCIE) announced that the EC market size was 17 trillion won (17 billion dollars) in 2000, which indicates 189.4 percent of the estimation. This is 1.67% of the entire industry market. MCIE estimated 30 trillion won (30 billion dollars) for the year 2001 and 187 trillion won (187 billion dollars) for the year 2005. (Korean Ministry of Commerce, 2001)

The Korean Government tries to implement the EC technologies in the workplace. To establish an efficient defense resource management system based on the continuous acquisition and life-cycle support (CALS) master plan, MND will integrate the logistics-related systems from acquisition to field employment and link the integrated system with government, civic, and various international defense related information agents. The main objective is to provide real time support to the military, both in wartime and in peacetime.

To establish a foundation for the integrated information network, MND will install the military's wide area network (WAN) and local area network (LAN) at units higher than a regiment. MND also plans to construct 150 digitization training centers in units higher than a brigade or division by the end of 2000 (Korean MND, 2001)

Defense Procurement Agency (DPA) opened its Web site for business. Connecting to 20,000 Agencies and 14,000 supply companies, DPA exchanges 2.8 million documents in electronic form through EDI (Korean DPA, 2001)

The acquisition legislation in both countries needs to be updated in order to allow the use of EC for most of the procurement processes.

5. Situation of Dot.com Companies

In spite of the rising number of people drawn to buy online, most of the Dot.com companies are experiencing troubles. According to conclusions of the European Dot-Com Entrepreneurs Report published by the Management Consulting Services Practice at PricewaterhouseCoopers, "They ignored traditional business principles and are looking instead to cash in quickly on short-term profits." This is one of the explanations why two-thirds of B2C and half of B2B dot.com companies are struggling to survive or are failing. Dot-com companies appeared to be more pessimistic about the future of B2C dot.coms than were incumbents. As these young companies have burned through their venture capital funding, they have been forced to lay off employees, shutter their sites or file for bankruptcy protection, and in some cases, all three. These events have been causing the down turn of the global economy.

III. EC IN THE DOD OF THE UNITED STATES

A. HISTORY

EC development started when President Clinton issued a memorandum in 1993 mandating the use of EDI and EC in the Federal acquisition process. A year later, Congress passed the Federal Acquisition Streamlining Act of 1994 that required the entire Federal Government to begin using EC. (Gerbert, 2001)

DoD and the entire Federal Government are using EC to increase the efficiency of the Government's procurement process, to reduce costs, and to eliminate paperwork. (Ackerman, 1999)

In November 1997, the Secretary of Defense released the Defense Reform Initiative Report (DRIR) introducing the principles of Electronic Business (E-business). The report stated that "a full commitment to e-business operations will not only result in tangible savings, but will also change the DoD's business culture, forcing managers to think differently and act more efficiently". Thus, by using E-business principles, the concept of EC has been propelled beyond the EC standards process. (USA Secretary of Defense, 1997)

The Joint Electronic Commerce Program is a result of the Defense Reform Initiative. Established in May 1998, the program is intended to increase the use of electronic business practices that are common in private sector companies. These practices include the use of the Internet and commercially available computer software to conduct business. Through this program, the Department expects that all of its business functions, from acquisitions to health care, will be able to reduce operating costs and streamline business processes. Ultimately, it is viewed that such technologies would be used not to simply automate existing processes but to also help fundamentally change the way DoD does business. (US GAO, 2000)

The DoD strategic EC vision is that by 2010, an enterprise-wide electronic environment will exist where best business practices and enabling technologies are used to facilitate the most efficient exchange of the full range of business information,

resulting in streamlined and rapid response to the war fighter and supporting Defense missions. (USA Joint Electronic Commerce Program Office, 2000)

B. INITIATIVES

1. DoD Electronic Mall

The DoD EMALL is a single entry point for DoD customers to find and acquire off-the-shelf, finished goods items from the commercial marketplace. The DoD EMALL offers cross-store shopping for the purpose of comparison pricing and best value decision-making. Vendors on DoD EMALL meet Federal Acquisition Regulation (FAR) requirements so there is no need to verify that vendors meet statutory requirements. (USA Defense Electronic Business Program Office, 2001m)

In addition to providing one-stop visibility for ordering from DoD electronic catalogs, the EMALL provides one stop visibility of order status. The DoD EMALL is currently on-line and can search across and order from the following sources: DLA inventory control point managed commodity items and Defense Reutilization and Marketing Office reutilization items, Defense Supply Center Philadelphia's Ascot Electronic Catalog for clothing and textiles items, several commercial catalogs, including Grainger, 3M, Maintenance Warehouse, Fastenal, Javits-Wagner O'Day (JWOD) mandatory sources, Newark Electronics, and 300 information technology contracts of commercial part numbered items, Navy's ITE Direct Electronic Catalog of ITE hardware and software items, and Inventory Control Point (ICP) long-term contracts for photographic and lighting supplies, food services, and other mechanical items. (USA Defense Electronic Business Program Office, 2001n)

The EMALL provides the benefits of reduced logistics response time and improved visibility of both government and commercial sources of supply, multiple sources of supply in a single shopping session, secure transactions, savings from negotiated volume discounts, DoD authorized use, pre-negotiated contracts, simplified procurement, as well as facilitating the use of the government purchase card. (USA Defense Electronic Business Program Office, 2001n) Additional effort is planned to add the visibility of other existing DoD electronic catalogs such as the Army's A-mart and the Tank and Automotive Command's (TACOM) tire store; expand the military services and

defense agencies "stores" within the three corridors and add additional items within the existing "stores". On the DoD EMALL, soldiers can order commercial catalog items such as repair parts, office supplies, electrical items, fasteners, batteries, aircraft covers, nautical items, packing materials, and information technology products. (USA Defense Electronic Business Program Office, 2001n)

2. Electronic Document Access Project

Electronic Document Access (EDA) acts as an electronic file cabinet for the storage and retrieval of contract documents used by multiple DoD activities. EDA replaces the paper process by providing a single, read-only "electronic file cabinet" that can be accessed by any authorized user, both within DoD and in the vendor community. Vendors may be authorized to view only contract documents that match their validated Data Universal Numbering System (DUNS) number or Commercial And Government Entity (CAGE) codes. (USA Defense Electronic Business Program Office, 2001a)

At the present time, the system provides storage and retrieval of post-award contracts, contract modifications, personal property and freight government bills of lading (GBLs), vouchers, Contract Deficiency Reports (1716s), Summaries of Voucher Line Data (110 Reports), Materiel Acceptance and Accounts Payable Reports (MAAPRS), and Army direct vendor deliveries (DVDs) in a compressed text format running on DoD's private network. EDA capitalizes on communication networks and commercial tools that are widely used today. EDA provides payment technicians at the Defense Finance and Accounting Service (DFAS), DoD contract officers, procurement officers, and transportation technicians with the ability to view and process documents without paper copies. Vendors have view-only capability of their contract documents. (USA Defense Electronic Business Program Office, 2001a)

Benefits derived from EDA to date include a reduction in the DoD's unmatched disbursements, paper consumption, paper storage requirements, and increased convenience and efficiency provided to EDA's user community. Several contract writing systems have completely or partially transitioned from paper to electronic contracts and have noted improved access time by having documents readily available online. Users all view the same document(s) and the information is entered once and used many times,

which eliminates the potential for transposition errors and redundant maintenance of information.

3. DoD Business Opportunities

DoD Business Opportunities (DoDBusOpps) is an electronic portal for vendors to identify business opportunities within the DoD components. The portal indexes open and show active solicitation data from multiple sources (US Army via their Single Face to Industry site, the US Air Force via FedBizOpps, the Defense Logistics Agency (DLA) via their Procurement Gateway, and the US Navy via their Navy Electronic Commerce Online (NECO) web site), providing a central source for over 70% of the Defense Department's opportunities. (USA Defense Electronic Business Program Office, 2001l)

The web site (http://www.dodbusopps.com) offers contractors a single point of entry to search for DoD on-line solicitations. DoD BusOpps is a high-speed, high-performance, easy to access, and easy to understand portal that has been created in a flexible and scalable structure allowing for the inclusion of smaller DoD organizations. There are currently 593 DoD contracting activities that feed their solicitation data into BusOpps: (USA Defense Electronic Business Program Office, 2001b)

- Army -- 118 sites
- Navy/Marine Corps -- 113 sites
- Air Force -- 125 sites
- Defense Logistics Agency -- 3 sites
- Defense Information Systems Agency -- 5 sites
- The multi-Service Defense Electronic Business Exchange (DeBX) 229 sites

BusOpps provides links to the actual solicitation and to the bidding module where they exist natively on the Internet, and to any technical data repository associated with it, and links to the CCR web site to register. (USA Defense Electronic Business Program Office, 2001b)

4. Central Contractor Registration Project

Central Contractor Registration (or CCR) is a government database of past, current, and potential vendors. According to Defense Department regulations, vendors must be registered in CCR prior to the award of a contract, basic agreement, basic

ordering agreement, or blanket purchase agreement, unless the award results from a solicitation issued on or before May 31, 1998. (USA Defense Electronic Business Program Office, 2001c)

CCR contains vendor information pertinent to business and financial transactions. Within the Department of Defense, registration is required in order to receive contract awards or invoice payments. CCR, a "self-service" application where the vendor controls their own data by entering, updating and renewing their information, allows the Government to keep standard and accurate data, especially financial data, on both current and potential contractors. (USA Defense Electronic Business Program Office, 2001c)

The most important change as a result of populating CCR is the efficient way vendor payments are made. CCR can provide, on a daily basis, electronic funds transfer (EFT) information to every agency that makes payments to their vendors. They are then able to automate the payment processes and provide immediate distribution and tracking of payments. 90% of all electronic payments made by DoD are done using the information found in CCR. With the FAR clause now placed in contracts, everyone knows that if contractor's CCR registration is not complete and up-to-date contractors do not get paid (USA Defense Logistics Information Service, 2000), unless the transaction is included in a selected group that does not require registration, such as (USA Defense Electronic Business Program Office, 2001c)

- Amounts below the micro-purchase threshold of $2,500
- Awards made to foreign vendors for work performed outside the United States
- Classified contracts or purchases
- Contracts awarded by deployed contracting officers in the course of military operations, including but not limited to contingency operations, (r contracts awarded by contracting officers in the conduct of emergency operations (i.e. natural disasters, and national/civil emergencies)
- Purchases to support unusual and compelling needs

CCR benefits both users of the CCR: government personnel and vendors. To be active in CCR, vendors are required to register one time and check their information at least annually. Registration is free and since it is entered and maintained by the vendor, they have access to their registration at their convenience. The benefits found by the

vendors are the exact reason why the government uses CCR. Vendor information is never older than 365 days, it is accurate because it is entered by people who work with this data frequently, and is available on-line. The fact that payments are made much more quickly than before is an added advantage. (USA Defense Logistics Information Service, 2000)

As the use of CCR information is expanding beyond DoD, vendors are encouraged to register and authorized government personnel are encouraged to gain access to the CCR either through the web or direct access. The CCR database will soon merge with the existing CAGE (Commercial and Government Entity) database. Until recently, much vendor information was contained in numerous databases. Vendors were asked to provide the same data to each buying office, payment office, and the CAGE office. The consolidation of these databases means less paperwork and more visibility for the vendor community, and more precise, up-to-date data for the procurement community. (USA Defense Logistics Information Service, 2000)

5. Past Performance Automated Information System Project

DoD acquisition officials want to acquire goods and services that represent the best value for the government. Those officials' confidence in a prospective contractor's ability to perform the contract requirements satisfactorily is an important factor in making a source-selection decision. One method of gaining this confidence is by evaluating a prospective contractor's performance on recently completed or ongoing contracts for the same or similar goods or services. (USA Defense Electronic Business, Program Office, 2001d)

Past Performance Automated Information System (PPAIS) serves as the common repository for data on a contractor’s past performance from throughout the Department of Defense. This data consists of two categories: "report cards" and "passive." The report cards are written by customers during and after contract performance and reflect how the contractor performed the effort under the contract. These reports are collected in a number of Component systems and then fed into PPAIS. The passive data is comprised of information collected for other purposes relevant to past performance. This includes both delivery and quality data, as for example, Quality Deficiency Reports. The passive data will be compiled into a single database from which a past performance rating may be

derived. The passive capability is expected to be deployed in FY02. (USA Defense Electronic Business, Program Office, 2001e)

The benefits of PPAIS include reduced time and cost of proposal evaluation by eliminating the need to separately collect and process reports on contractor performance. PPAIS supports better source selections by identifying high-risk offerors. It reduces the need for questionnaires and allows contractors and the government to rely on a single source for data. It expedites proposal preparation and evaluation and facilitates communications with contractors. Upon deployment of the passive capability, PPAIS will allow use of past performance as an evaluation factor on lower dollar value procurements where the collection effort had been prohibitively costly.

Access is controlled by points of contact in the Components through a distributed group structure. Government personnel seeking access to past performance data for source selection should contact their Agency group owner using the PPAIS membership request process. Contractors may obtain access to their own records by generating a Marketing Password Identification Number (MPIN) in the Central Contractor Registration (CCR) system. (USA Joint Electronic Commerce Program Office, 2001)

The PPAIS system is managed by the Department of the Navy under the guidance of the Defense Electronic Business Program Office and the Past Performance Integrated Product Team.

6. Wide Area Work Flow-Receipts and Acceptance Project

Traditionally, the Department of Defense (DoD) acquisition process has been paper-based, labor intensive, and heavily dependent upon manual and repetitive data inputs from multiple functional communities. This environment restricts access to source data provided by various contractual, financial, and logistic documents and in numerous Automated Information Systems (AISs). In response to the DoD's Memorandum of 1997, "Moving to a Paper-free Contracting Process by January 1, 2000", the Wide Area Work Flow-Receipts and Acceptance (WAWF-RA) initiative is built on a foundation of full utilization of source data input – shared electronic documents, data, and information. (USA Defense Electronic Business Program Office, 2001o)

Wide Area Work Flow-Receipts and Acceptance (WAWF-RA) is a Paperless Contracting DoD wide application designed to eliminate paper from the receipts and acceptance process of the DoD contracting lifecycle. The goal is to enable authorized Defense contractors and DoD personnel the ability to create invoices and receiving reports and access contract related documents. (USA DoD Paperless Contracting, 2001)

In the traditional DoD business method, three documents are required to make a payment - the contract, the receiving report and the invoice. Each of these may arrive at the payment office separately if they are paper. They are processed individually as they arrive. Information is then manually keyed into the payment system. Using WAWF-RA, electronic documents are shared, eliminating paper and redundant data entry. Data accuracy is increased and the risk of losing a document is greatly reduced. (USA DoD Paperless Contracting, 2001)

The contract is available through a seamless interface with an application called Electronic Document Access (EDA). Contractors have electronic options for submitting invoices and receiving documents. They can submit documents on the web, through File Transfer Protocol (FTP), or through Electronic Data interchange (EDI). (USA Defense Electronic Business, Program Office, 2001f)

Authorized DoD personnel receive notification electronically of pending actions and have a virtual folder of documents accessible. Digital signatures are used to authenticate the users and to digitally sign documents. In some cases, a user ID and password can be used in lieu of a digital signature. (USA Defense Electronic Business, Program Office, 2001f)

WAWF-RA supports DoD's efforts to reduce unmatched disbursements in the DoD receipt, acceptance, entitlement and payment process through data sharing and electronic processing. The benefits to DoD are global accessibility of documents, reduced need for re-keying, improved data accuracy, real-time processing, and secure transactions with audit capability. For vendors, benefits include the capability to electronically submit invoices, reduction of lost or misplaced documents, and online access to contract payment records. (USA Defense Electronic Business, Program Office, 2001f)

For security purposes, access to appropriate functions and documents are controlled through the user registration process. In addition, Public Key Infrastructure (PKI) certificates are used to verify user identification, and to digitally sign documents when required.

7. Department of Defense Technical Data Solution

The DoD's Technical Data Solution (TeDS) is a Web site (https://DoDTeDS.com) that enables the electronic dissemination of Technical Data Packages (TDPs) to the DoD's vendor community. The Air Force is the first service to utilize TeDS to distribute their TDPs. Their implementation is known as the Air Force Technical Data Solution, or AF TeDS. The site's primary audience is the vendor community, with the content being created by the DoD acquisition community. A TDP is a compilation of drawings, engineering data lists, and other materials related to an active DoD solicitation. (USA Defense Electronic Business Program Office, 2001g)

In the past, vendors had to request a CD of the appropriate TDP from the government buyer. This process could take anywhere from a few days to a few weeks. From a vendor perspective, TeDS has provided vendors a tool that grants real-time access to TDPs, thereby saving valuable time. From an operations perspective, TeDS has made the procurement process more efficient. The process not only saves the government money by reducing inventory costs, but also provides returns in the form of increased security and quality. (USA Defense Electronic Business Program Office, 2001g)

Some of the major benefits of TeDS to the DoD, the JECPO, and the Air Force include (USA Defense Electronic Business Program Office, 2001g)

- Creating and sponsoring systems that support the war fighter
- Contributing to achieve Paperless Contracting
- Streamlining the TDP request and dissemination functions of the Air Force, ultimately improving customer service and increasing customer satisfaction
- Establishing a Physical Firewall between the Air Force and its public customers while providing approved users with Sensitive but Unclassified (SBU) data
- Providing a workflow management capability; allowing the Air Force engineering and acquisition communities to streamline the way in which they manage requests for TDP dissemination

- Helping the Air Force move in the direction of adopting industry best practices as well as reducing inventory costs and the lengthy cycle time requiring unnecessary inventory level
- Increasing the level of quality of DoD data that is sent to vendors, as well as increasing the level of quality control over the entire procurement process
- Reducing mailing, reproduction, and CD-ROM costs

C. PROBLEMS

Although there has been improvement in DoD's business since the application of EC, certain issues still need to be addressed. These include EC architecture for the entire DoD, the role of the Joint Electronic Commerce Program Office (JECPO), Security and Outcome measures. (US GAO, 2000)

1. Architecture

EC architecture is needed to integrate business processes and information systems across the military services and Defense agencies. This system integration is a major hurdle in implementing broad and comprehensive digital government infrastructures. (Elmagarmid and ZmcIver, 2001)

Although the Department is making efforts to develop an integrated EC architecture, little progress has been made and the Department runs the risk of having the services and Defense agencies develop and implement initiatives that are redundant, do not readily share information, and do not maximize the Department's investments in information technology.

The JECPO has taken several steps to begin the effort. Despite the efforts made thus far, much work remains to be done to develop an integrated EC architecture. The Air Force and Army have already addressed architecture development within their respective services. So far, DoD had not determined the number and scope of the business areas that need to be analyzed to develop an EC architecture. To date, only one business area, that of procurement, has identified its architecture requirements. It is interesting to note that an analysis of this business area actually began before DoD called for the EC architecture.

DoD officials estimate that initial architecture development efforts would take 3 to 5 years to complete even if all principal staff assistants work diligently toward developing architecture requirements for their respective business areas.

2. Joint Electronic Commerce Program Office

The Joint Electronic Commerce Program Office (JECPO) is responsible for developing EC in DoD. JECPO, as seen in Figure 4, is under the Office of the Chief Information Officer (CIO). (US GAO, 2000) DoD may have difficult in effectively achieving its electronic business goals because of the way JECPO has been created. The office is organizationally situated to receive its funding and personnel through two Defense agencies - the Defense Logistics Agency (DLA) and the Defense Information Systems Agency (DISA). Consequently, JECPO has to report through these agencies' chains of command as well as to the CIO. This setup, that functioned well for a time, eventually did not work and the CIO was left out of the communications chain altogether.

This organizational setup has diluted the CIO's authority over the JECPO. Furthermore, ambiguities over who is in charge have created day-to-day management issues that have impeded the JECPO's effectiveness.

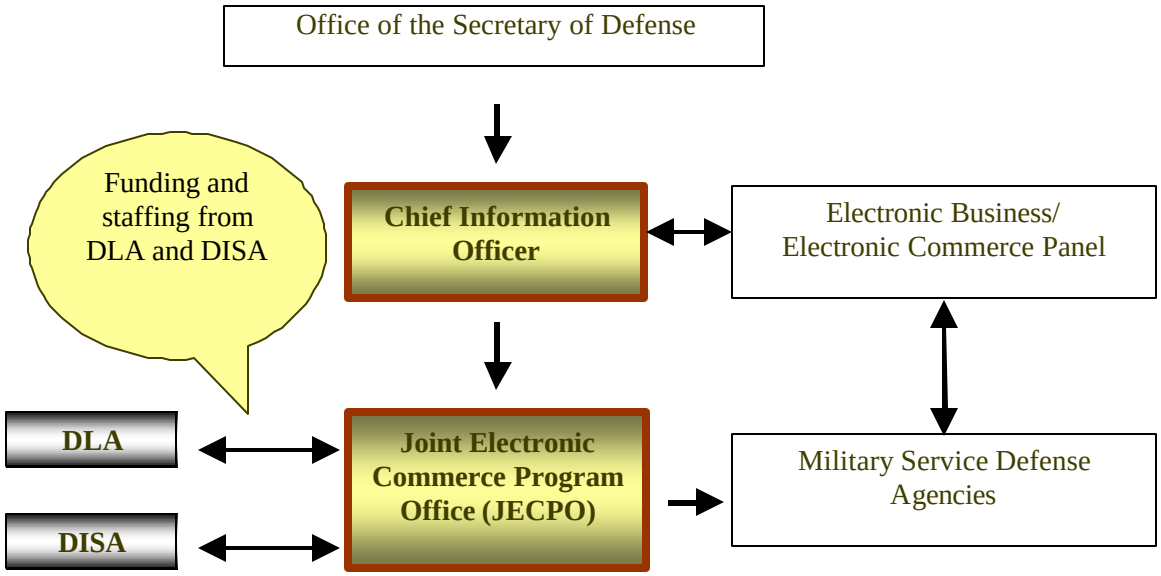

Figure 4. Organizations Involved in EC in the DOD. (After: US GAO, 2000)

3. Security

Individuals right to privacy in EC certainly are in flux, and face myriad social and legal decisions in this area. (Shapiro, 2000) The DoD EC goals cannot be fully realized unless it improves its ability to safeguard and verify the authenticity of electronic data and transactions.

EC systems should be secured from hackers who will look for opportunities to modify, steal, inappropriately disclose, and destroy sensitive DoD data. EC systems must have the ability to not only protect confidentiality but also disseminate information properly. (USA DoD, 2001a)

DoD is preparing a Public Key Infrastructure program, which will provide important safeguards. However, it will be several years before the program will be fully implemented. So far, the program is making progress, but new requirements are continuously expected to create some delays. DoD is still assessing what needs to be done to enable its systems and software to accommodate the digital signature and encryption capabilities expected.

4. Outcome Measures

The current initiatives primarily cover aspects of the DoD business processes of acquisition, logistics, and financial management. They are directed at reducing operating costs and improving responsiveness to DoD personnel, contractors and vendors. The benefits are uncertain because many have not been fully implemented. Also, the performance measures have limitations.

DoD is assessing most initiatives through output measures, which provide status information, rather than outcome measures. Outcome measures show results or outcomes in terms of effectiveness, cost reduction, and impact. DoD should not just be satisfied with output it receives. It must focus also on the outcome data, which justifies the cost spent for implementing EC in DoD. Without outcome data, DoD cannot fully determine EC's success or failure.

These four problems are not the only problems with EC that DoD expects to face in the future. Many new IT techniques will appear, and together with the aforementioned difficulties will cause new problems. Truly, the only thing constant is change. Therefore,

DoD should not focus solely on tackling the above problems but also maintain continuous benchmarking and research and development (R&D) to guard and prepare for new developments in EC and IT.

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IV. REQUIREMENTS FOR GOVERNMENT EC

A. FRAMEWORK FOR IMPLEMENTATION

Technologies must be in place for EC to exist. Not only many interconnected networks, but also software and hardware components are required to provide the support structure, including network switches and hubs, database software, encryption hardware and software, multimedia support, and the World Wide Web.

A detailed description of required hardware and software is of limited value because technology is changing at such a fast pace and any business that engages in Electronic Commerce must be prepared to continuously adapt and invest in new technologies as they appear. An overview in the general structure required becomes more appropriate.

The EC infrastructure is a combination of software, hardware, and communications media components that support EC. This infrastructure is intended to allow communication within the military organizations, with other government agencies, as well as between the government and the private sector. The EC infrastructure design is expected to be continuously reviewed and revised as the proposed infrastructure is achieved and demands for enhanced or additional functional and operational capabilities exceed the existing infrastructure. (USA DoD, 2001a)

To implement EC in the Armed Forces of Brazil and South Korea, the following four major focus areas should be defined in order to achieve the intended goals, objectives, and strategies: (USA Defense Electronic Business Program Office, 2000k)

- Integration (cross-service and cross application support)
- Infrastructure (support for network and systems)
- Business Applications (support for processes)
- Outreach and Education (support for people)

The last three focus areas of Infrastructure, Business Applications, and Outreach and Education, align directly with the EC goals. The other major focus area of Integration is adopted as an overarching and crosscutting area, which includes activities that will ensure that each of the other focus areas work together in a fully interoperable

and seamless environment. An overview of each of the major categories contained in the framework is described below.

1. Integration

The integrating functions consist of collecting requirements, funding initial project development, and ensuring projects are merged into the overall EC realm. The goal in this area is to promote consistency within the Armed Forces for future EC projects and to foster a common business environment that utilizes interoperable solutions. (USA Defense Electronic Business Program Office, 2000k)

a. EC Architecture

The objective of the EC architecture is to provide a common vision and guidance for the effective and efficient use of the systems that provide the underpinnings of the business operations. Given the complexity of EC interactions within the Armed Forces of both Brazil and Korea, and between business operations and non-business operations, maintaining the "big picture" of interrelationships becomes exceedingly difficult.

Through this common vision, the services and agencies will be able to seek compatible EC solutions, resulting in the use of common infrastructure implementations and interoperable hardware and software. The existing architecture should evolve to address multiple resource domains reflecting the areas in which the Armed Forces do business: material, services, installations, personnel, transportation, and information. Each of these domains encompasses interrelated business operations. Development of these domain-specific architectures, consistent with the business operations and implementation principles, will help maintain a consistency of purpose, operations, and implementation, while a diversity of organizations and geographically dispersed locations take part.

The EC architecture should be developed in stages, with each version reflecting an increased level of specificity. The Services and Agencies should review and make recommendations on each version, in order to continuously improve it. The EC architecture follows framework consisting of the operations, systems, and technical views.

The Operational View provides a description of the tasks and activities, operational elements, and information flows required to accomplish or support an operation. The Architecture identifies the following (USA Defense Electronic Business Program Office, 2000 h) as the functions needed to complete a business transaction:

- Develop a transaction
- Manage a transaction
- Manage reference data
- Provide performance support
- Control access to and protect transactions and reference data
- Transmit and translate transactions and reference data

The *Systems View* provides a description of systems and interconnections providing for, or supporting, the operational elements and information flows described in the Operational View. (USA Defense Electronic Business Program Office, 2000i)

The *Technical View* provides a description of the minimal set of standards profiles governing the arrangement, interaction, and interdependence of system parts or elements whose purpose is to ensure that a conformant system implementation will be interoperable with appropriate external environments. (USA Defense Electronic Business Program Office, 2000 h)

These three views are interconnected. The Operational View describes the business operations of the military organizations and the interactions needed to accomplish the business transactions required. From this view, the architecture derives an information systems and communications environment to efficiently and effectively support the business operations. The Systems View is augmented by a description of constraints on the implementation environment expressed in various specifications and standards expected to be controlling it (Technical View).

b. Objectives and Tasks of the Integrated EC Architecture

The purpose of the EC architecture is to provide a tool to assist in improving, reengineering, and integrating EC best business practices. Listed below are the goals of the EC Architecture: (USA Defense Electronic Business Program Office, 2000 h)

- Define a common EC business environment: Common EC business supports the Armed Forces through a common set of tools, software, data repositories, standard data element definitions and infrastructure. It also spans the majority of business operations and their linkages with combat-related operations. Defining this common business environment allows for efficient EC implementation and operations.
- Provide a mechanism for optimizing business operations and opportunities: Comprehensive architectures provide an analysis tool for determining future operational requirements and business opportunities. Examples include:
  - Compatibility of business operations: Business operations will be conducted in a harmonious manner across components' boundaries
  - Commonality of business solutions: Solutions developed by one activity will be available for reuse by other activities
  - Interoperability of business systems: Business system interoperability will enhance the Armed Forces' ability to interface with industry while maintaining a continuous process flow across traditional functional or organizational boundaries.

c. Performance Measures

Over time, the architecture is expected to expand to cover all business operations. However, there should be a clear way of measuring the completeness of this effort until the magnitude of this scope is determined, which will be an outcome of the architecture effort.

2. Structure

To accomplish the overall objective, a robust infrastructure supporting business applications is essential. Key elements of that infrastructure include the transportation and translation of data; security and access controls; and maintenance of standards to support interoperability. These key elements can be achieved by the use of Product Data Markup Language (PDML), Commercial Standards, EC Standards, and ePortal. Details of how these projects can benefit the defense organizations are presented below. (USA Defense Electronic Business Program Office, 2000k)

a. Product Data Markup Language (PDML)

Product data is an essential component of procurement actions. In item repair or reprocurement actions where product data is required, the technical data package must be assembled and then distributed to potential vendors. Both processes can be automated through paperless operations. PDML is an electronic commerce solution to

product data management. It also is a key element in acquisition and logistics process improvement with respect to product data management and configuration management. PDML is an Extensible Markup Language (XML) based vocabulary for the integration of product data contained in a system of heterogeneous data repositories. A brief description of XML is given below.

XML is an emerging data-description standard designed to simplify Web-based EC transactions among supply-chain partners. EDI is the de facto legacy standard for automating order processing and document interchange among intra-company or inter-company applications. It enables highly secure document exchanges in a compressed, machine-readable form over private value-added networks (VANs). (Kay, 2000) XML is quickly becoming the technology of choice for exchanging structured information over the Internet, Intranets and Extranets.

XML is a data format for structured document interchange on the Web. Like Hyper Text Markup Language (HTML), it is derived from Standard Graphics Markup Language (SGML). However, unlike HTML, which was created to allow cross-platform formatting of information for display, XML is not simply for organizing data. (TecTarget.com Inc., 2001b) One of XML's primary uses is information exchange between different and potentially incompatible systems. Its goal is to enable generic SGML to be served, received, and processed on the Web. XML has been designed for ease of implementation and for interoperability with both SGML and HTML. It is being used to provide a format for interactions between business applications.

PDMLs allow authorized access to product data contained in repositories through an XML based WWW browser. With PDML, product data can be transacted between repositories without manual intervention to locate, re-index or re-key the data. This enables the elimination of duplication in data repositories such as between a Service engineering center and a Defense supply center. It also facilitates the large-scale relocation of product data between major sites, such as would be required for a major logistics contract recompetition. PDML defines a data usage architecture that starts with the assumption of data access and exchange over the Internet using existing Internet protocols and languages. This provides a general and ubiquitous platform that is more

stable and has a longer life span than point-specific solutions. In addition, the volume of development on the Internet results in tools and solutions that are more widely applicable, more functional, and far less expensive than those applicable to integration point solutions. Tools for processing XML data, for example, are freely available on the Internet. This keeps the PDML solution general, uniform, and widely applicable.

b. Commercial Standards

Adopting commercial EDI standards supports the Defense's process improvement. Replacing the existing logistics transaction formats serves as a necessary stepping stone to moving towards international open systems standards. As other EC technologies evolve and business requirements are identified, new standards using these technologies will be developed.

c. EC Standards

Electronic Data Interchange (EDI) is the computer-to-computer exchange of business information using a public standard. EDI is a central part of EC. The EDI standards development organizations are influencing and incorporating new and emerging technologies, such as the aforementioned XML and Common Access Card with the purpose of establishing global standards.

EC standards ensure that any proposed EDI implementation convention to be used by the Brazilian and South Korean Armed Forces not only fully complies with published national and international standards but also reflects practices in the private sector. This ensures interoperability between their organizations and with their trading partners.

d. E-portal

Under the E-portal concept, users execute a single sign-on to an infrastructure that provides a single point of entry, authentication and authorization functions. The ePortal can accomplish the authentication function using (Public Key Infrastructure) PKI Keys or user IDs and strong passwords. (USA Defense Electronic Business Program Office, 2001j) The authorization function depends on the development of processes to allow information owners and managers to administer and control access to their information through EC. Additionally, the respective EC applications

administers and controls what users can see and do through a new permissions criteria process.

3. Business Applications

As part of the effort to assist with the implementation of EC technologies, defense organizations from Brazil and South Korea should identify requirements for developing and supporting implementation of systems that perform certain business functions to enhance EC. The primary goal is to increase readiness and decrease acquisition and transaction costs. As a first step, the Brazilian and South Korean defense organizations could implement some of the initiatives undertaken in the United States' DoD. The first initiatives could be the following projects: Central Contractor Registration, Electronic Document Access, and Electronic Mall. More details regarding these projects were provided in Chapter III. The Electronic Mall should be implemented with a few categories that could evolve as the project succeeds.

4. Outreach and Education

Critical to the attainment of the EC goals and objectives is its ability to bring about the cultural changes necessary to transition from primarily paper-based business practices to an environment that employs EC across its entire business operations. To fulfill this goal, the following problems should be pursued:

- Formulate, champion, and disseminate EC advantages
- Provide support to the military organizations and vendors to promote education, and training - and information assistance that supports adoption and implementation of EC technology in a way that addresses the military organizations' business requirements
- Establish feedback mechanisms to ensure customer satisfaction

To do these, an information assistance center should be established linking the military organizations and trading partners to the EC initiatives and projects.

B. DATABASES

1. Description

A database is a collection of data that is organized so that its contents can easily be accessed, managed, and updated. The most prevalent type of database is the relational database, a tabular database in which data is defined so that it can be reorganized and accessed in a number of different ways. A distributed database is one that can be

dispersed or replicated among different points in a network. An object-oriented programming database is one that is congruent with the data defined in object classes and subclasses. (TechTarget.com, Inc, 2001c)

Database servers are required to grant access to government-wide databases. Some data may be limited to government use such as sensitive data that may be accessed only by the government contracting officers and staff. Examples of these data are notices of contract award, trading partner registration, response to Request for Quotes (RFQs) and private text.

In other situations, some data may and should be releasable to the general public. Examples are instructions to vendors in how to perform transactions with the government through EC, announcements to citizens, RFQs, and contract award information.

All of the public data may be either centralized or distributed as long as it need be updated only at one location. Most of the sensitive data should reside in agency systems, but trading partner registration data must be accessible to all contract officers.

It is important to take into consideration that data regarding operations, use of weapon systems, confidential messages, tactic and strategy publications, operations and exercises results are already stored in databases that are stored, in most circumstances, on the same network that will be used for the EC system, which requires special attention. In the same way as safeguarding EC transactions, databases that contain sensitive data need protection, requiring security certification by vendors that have access to them.

2. Requirements

The goal of the EC architecture is to ensure portability, interoperability, scalability, compatibility, and extensibility among agencies and value-added networks (VANs). The proposed databases must track all required elements in a centralized, decentralized, or combination network of both methods. Agencies and trading partners must have access to government-wide acquisition policies and procedures, partner agreements, and other pertinent information. The EC database architecture may be implemented as client/server, distributed, or a combination of both environments, as depicted in Figure 5. This offers portability, interoperability, and scalability for database

applications at the source-code level. (USA Federal Electronic Commerce Acquisition Team, 1994)

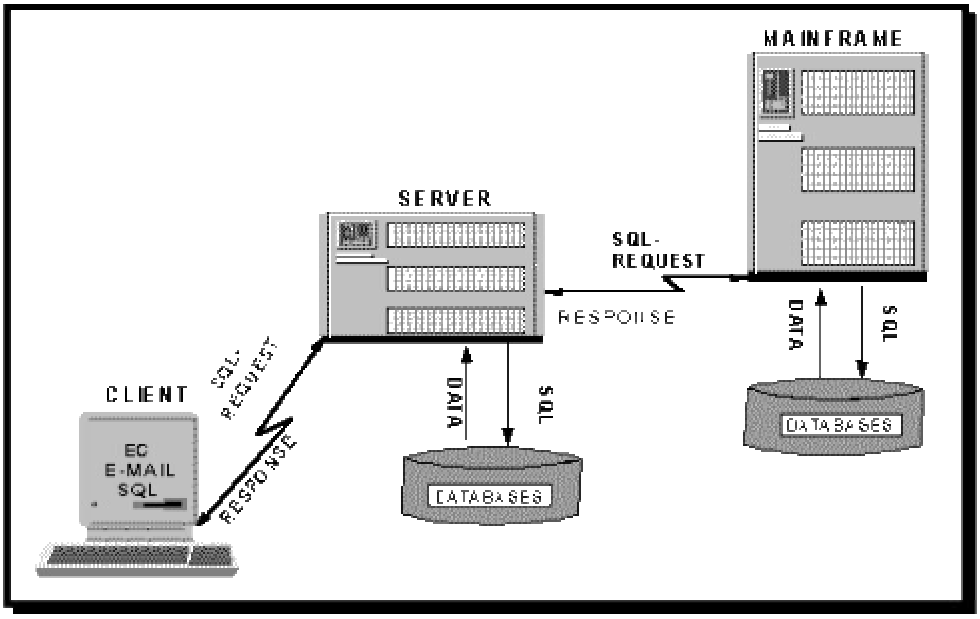

Figure 5. Overview of EC/EMAIL/SQL Government-Wide Client/Server Distributed Data Multiplier Environment.
(From: USA Federal Electronic Commerce Acquisition Team, 1994)

Access to databases such as trading partner agreements, regulations, implementation conventions, and the trading partner registration database do not directly impact the capability of any of the above architectures to convey information between agencies and trading partners. Periodic access to these databases will be useful in monitoring adherence to procurement regulations and implementation constraints. Access to the trading partner registration database will allow agencies to check trading partner status before issuing contract awards.

With a centralized architecture, if the network entry point (NEP), or any other common point through which all traffic passes, has access to all these databases, then common regulations and constraints can be monitored or enforced at this one location. This same monitoring can be achieved with the distributed architectures, but it will have to be done at either the gateway or agency. The impact of requiring monitoring at many locations may not be significant. In any case, agencies must maintain agency specific policies and procedures, trading partner agreements that may vary from agency to

agency, and procurement regulations, which will necessarily require enforcement at the agency location.

Other databases will be used to facilitate communication between agencies and trading partners. From the perspective of agencies and trading partners, there are no significant differences on the required database services that result from choosing a centralized or non-centralized architecture. Agencies and trading partners will both need access to these databases to look up electronic mail addresses.

3. Application Systems

The procurement or financial users should have all applications behave the same way, with the same "look and feel." The application system will provide the user with the capabilities of using EC to populate and access various database systems. The application system also will provide structured query language (SQL).

SQL is used to communicate with a database. According to ANSI (American National Standards Institute), it is the standard language for relational database management systems. SQL statements are used to perform tasks such as create or update data on a database and retrieve data from a database. (INT Media Group, 2001a)

An Application Program Interface (API) is a set of routines, protocols, and tools for building software applications. A good API makes it easier to develop a program by providing all the building blocks. (INT Media Group, 2001b)

EC and SQL APIs for the end-user may include the use of embedded procedure codes. This API approach will ensure that the application source code is portable, transparent, and independent of the underlining system architecture.

4. SQL API Concept

Agency and trading partner application programs must be able to communicate with the Database Management System (DBMS) through sets of API calls. Typically, SQL API calls are used in a distributed client/server environment. In this configuration, the API code is located on the client system where the program is executed. The DBMS program is located on the database server system where data are stored. API calls from the application take place locally within the client (agency/TP) systems. Communication between the API and the DBMS takes place over the network. SQL API calls offer an

advantage of minimizing the amount of network traffic between the APIs and the DBMS, particularly when APIs consist of "stored procedures" code, rather than embedded SQL code contained within an application program that is written in C, COBOL, etc.. (USA Federal Electronic Commerce Acquisition Team, 1994)

To illustrate this point, compare two client-server implementations: one with embedded SQL interface and the other using SQL API and stored procedures codes. Using the embedded approach, each SQL statement must be sent individually across the network from the client to the server; the client retrieves the results from the DBMS row-by-row. When using the SQL server API approach, with stored procedures code, a single SQL statement is sent from the client across the network to the Database. The results are a single stream of query messages. The single stored procedure API call over the network and back reduces the amount of traffic and greatly improves the network performance compared to the embedded SQL code as compared to multiple calls.

Sample SQL API calls to access the DBMS basic operation are depicted in Figure 6. (USA Federal Electronic Commerce Acquisition Team, 1994)

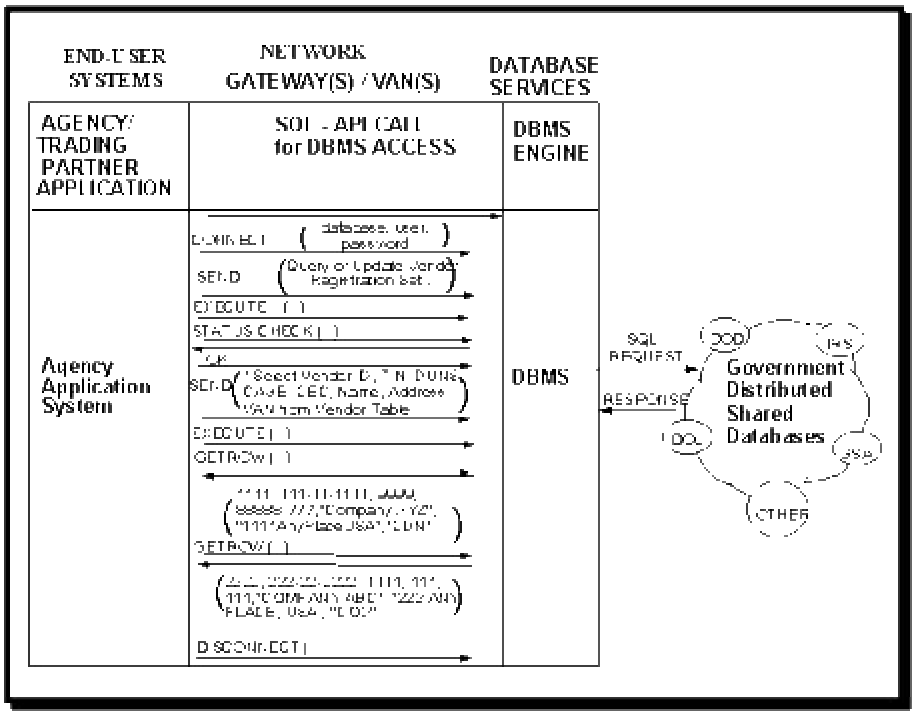

Figure 6. Sample SQL API Calls to Access Government-Wide Distributed Shared Databases.
(From: USA Federal Electronic Commerce Acquisition Team, 1994)

5. EC Database Issues

The use of EC for acquisition requires support of a number of databases as depicted in Figure 7. (USA Federal Electronic Commerce Acquisition Team, 1994) The following databases have been identified for this purpose: trading partner registration, trading partner agreements, government-wide Acquisition Regulations (GAR), and agency-specific GAR supplements. In addition to these, databases for EDI translation and for communication services are necessary. Issues related to these latter two database systems are not specific to electronic commerce and thus are not addressed here. Issues related to the remaining databases are more closely examined below.

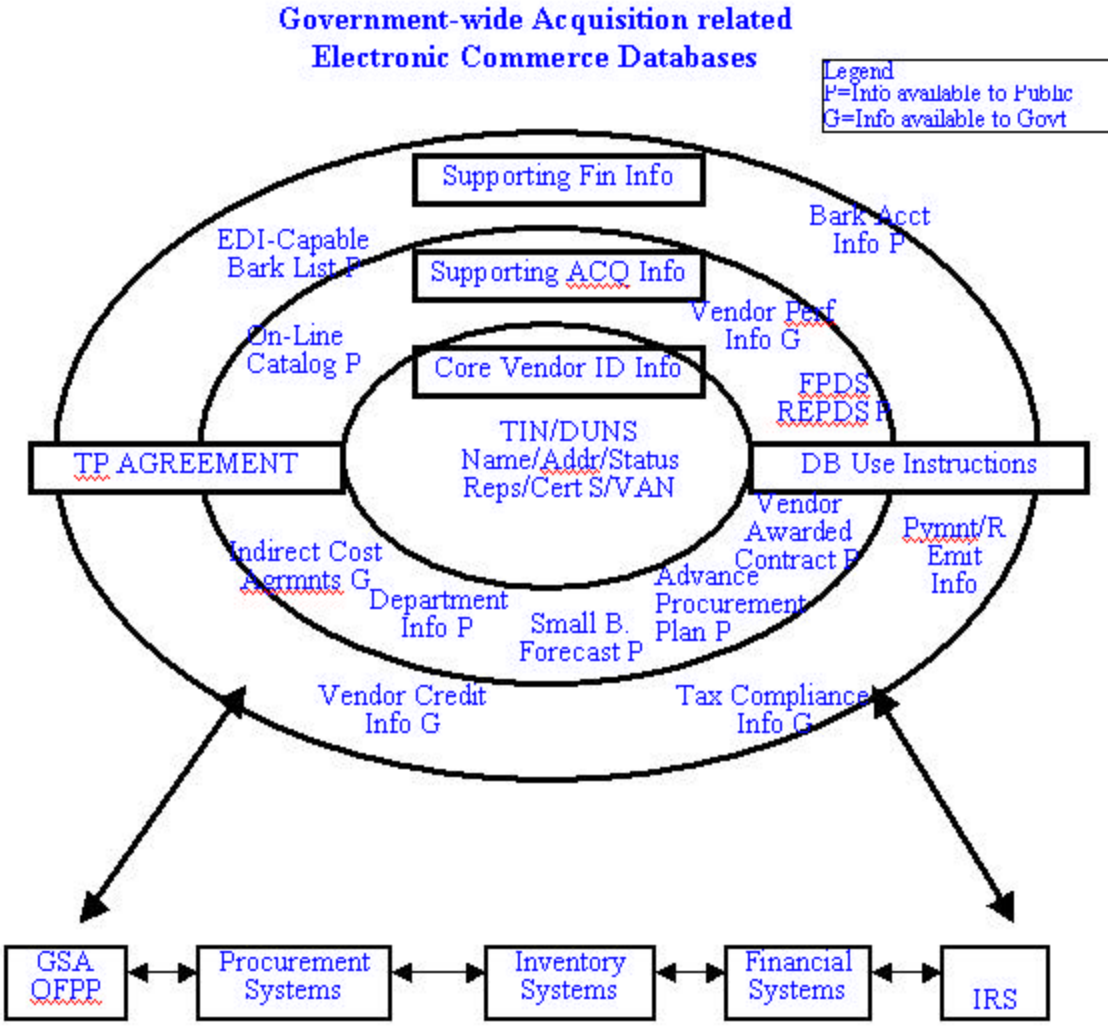

Figure 7. Government-Wide EC Databases.
(From: USA Federal Electronic Commerce Acquisition Team, 1994)

The information stored must be accessible to each government agency. Since each agency will have access to a gateway, if access to the trading partner database is available through the gateway, it will also have access to the trading partner registration database. This will leave the method for utilizing this data as a local issue, determined by each agency. Agencies could run local applications that access the database for trading partner specific information before contracts are awarded, or anytime after a bid is received. Alternatively, applications could run SQL that automatically queries the database whenever a trading partner bid is received. Any trading partner information stored in the database could then be supplied to the agency along with received bids. If trading partner specific information needs to accompany the bid, this information would be added at the gateway rather than the VAN.

The next question is the form the databases should take and who should be responsible for their administration. For the databases other than the vendor registration and trading partner databases, the information they hold is determined by the government. Thus, the government is either directly, or through contract, responsible for their administration. Although the vendor database contains information largely provided by vendors, the information will be used by procurement officials, and therefore the government should be responsible for administration. The trading partner database is for holding agreements jointly arrived at by both the government and vendor, and thus administrative responsibility may have to be decided upon by both agencies and vendors.

The structure of the information stored in the guidelines and trading partner database needs to be determined. If the information they contain is relatively unstructured, then a text database is the most suitable choice. If the data is more structured, as will be the case for the vendor registration databases, a relational database system is preferred since it has a solid mathematical foundation. A relational database is a collection of data items organized as a set of formally-described tables from which data can be accessed or reassembled in many different ways without having to reorganize the database tables. (TechTarget.com Inc, 2001a)

The acquisition regulations databases will be necessary when issues regarding regulations arise, and the trading partner database will be needed for clarifying

arrangements between agencies and vendors. Routine access to the vendor database will be required before procurement officials can make final determination on awards issuance. Thus, the primary focus below is on the vendor database.

The major difference to consider in determining the best choice for the vendor database is in the type of data to be stored. Generally, relational data base systems are preferred for storing structured data. They have a solid mathematical foundation, offer better data manipulation capabilities than X.500, and use a widely implemented standard language for access, or, SQL.

X.500 is an international standard established by the International Telecommunication Union (ITU) for electronic online directory services. The X.500 service is like a worldwide "phonebook," and serves as an online directory for electronic mail (e-mail) delivery systems and other applications that need directory service. People can use X.500 to look up e-mail addresses, postal addresses, and phone numbers. (University of Michigan, 1996)

There are a number of options for how relational databases might be used. There could be a relational database that is replicated as necessary, or there could be many copies of the same database with no single one of the copies serving as the master copy. Alternatively, the database could be distributed, for example, all copies would have the same data base structure, but the contents could vary from one geographical area to another to satisfy local requirements. One way of achieving this is by developing an application that uses X.500 to track the distribution of the data. X.500 could be combined with the Remote Database Access (RDA) protocol to support data distribution using relational database systems.

Interaction with remote relational database systems is achieved through the use of RDA. When RDA is used to access a remote database, if the desired data is stored at the remote site, it is returned to the user through the RDA protocol. If the desired data are not located at the site accessed, rather than the user searching for it elsewhere, an application program could use X.500 to locate the data and RDA to return the data to the user in the same way it was returned in the first case. From this perspective, the distribution of the data would be rendered transparent to the user. From a user's perspective it makes no

difference at which geographical site the database is entered since the results of any operation are the same regardless (discounting access controls). The database in effect maintains two views of the data. One is the logical view of the data that is presented by SQL and seen by the user. The other is the physical view of the data, representing the actual physical distribution of the data, maintained by X.500. Combining X.500 and relational databases allows a single integrated view of the data to be maintained and renders the distribution of the data transparent to the user. It also allows new sites for managing the data to be added indefinitely without impacting the user's logical view of the data. Combining X.500 and relational databases then provides an attractive solution that exploits the strengths of each: X.500 for tracking data, relational databases for storage and manipulation of data. (USA Federal Electronic Commerce Acquisition Team, 1994)

Agencies will need to decide whether frequently used databases could be replicated on-site if the requirements for updating were reasonable, for example, updating a small portion of the data every 24 hours, or whether a frequently used subset of a database could be replicated on-site, and the remainder of the database could be located at a VAN or other central site.

Agencies will also need to decide whether a frequently updated database could reside at a VAN or other central site and if a VAN could add database information to a transaction, so the recipient would not need to access the database, for example, adding information from the trading partner registration database to the trading partner's quote or blocking a quote from an ineligible, suspended, and debarred trading partner.

6. Recommended Government-Wide Common Shared Databases

The following common databases could be shared:

- On-line catalogs
- Government-wide Acquisition Regulations
- Vendor past performance file
- Trading partner agreements
- Master government contracts
- Vendor registration

- Tax compliance
- Specification of products

C. SECURITY

The Armed Forces need to protect their data. Data can include records of personnel, level of inventories, secret publications regarding tactics and strategy, and maintenance of weapon systems, among others. Implementing a security policy is key to protecting an organization's data and network.

When developing a security plan, organizations must assess their vulnerabilities, and the possible threats to security. What information do they need to protect? Who are the possible attackers and what is their intent, data theft or damaging the network? How will the organization respond to incidents? (Marland, 2000)

Increased guidance and alertness are vital to inform insiders of their responsibilities, to reduce carelessness and to inform the potential malicious actor of the consequences of such behavior. The Armed Forces must assess their security training and awareness programs to determine whether and the extent to which these programs effectively sustain a security environment commensurate with their critical asset protection requirements.

The private sector is leading the development of the EC and its success created additional challenges in terms of security. Online transactions performed between the private companies and its customers involve the need for credit card and social security numbers, as well as other confidential information, to be sent via the Web. Unfortunately, the explosion of the number of transactions online came along with an increased number of virtual crimes, forcing businesses and consumers to focus on Internet security. The same concerns of the private sector are relevant to the Armed Forces when deciding to go online. In the same manner that a customer needs to pay for goods or services required online, the Armed Forces make a payment when a placed order is received. A fraud occurs if someone maliciously changes the account to be credited, informs someone that the items were received, or a wrong order was placed.

The success of EC requires transactions that are both secure and reliable. If Internet users do not have confidence that their communications and data are safe from

unauthorized access or modifications, they will be unlikely to use the Internet on a routine basis for commerce. Secure and reliable telecommunications networks, effective means for protecting the information systems attached to those networks, efficient means for authenticating and ensuring confidentiality of electronic information to protect data from unauthorized use, and well trained professionals who understand how to protect their systems and data become relevant issues. (The White House, 1997)

There is no single technology or technique that can ensure that transactions conducted online will be secure and reliable. Accomplishing that goal requires a range of technologies involving the use of encryption, digital signatures, Public Key Infrastructure, anti-virus software, firewalls, biometrics, and passwords controls, among other precautions that are continually evolving. Of particular importance is the development of trusted certification services that support the digital signatures that permit users to know with whom they are communicating on the Internet. It is important to consider the investments required when implementing EC. The private organizations spent worldwide US$ 6.2 billion on security consulting in 1999 and International Data Corporation predicts the market to reach US$ 14.8 billion by 2003. (Harrison, 2000a)

1. Requirements

No matter what the extra costs and threats might be, there are advantages to implementing an EC system if the structure created by the Armed forces of Brazil and South Korea fulfills the requirements described below:

- Privacy –ensure that the information transmitted over the Internet has not been captured or passed on to a third party without knowledge. (Deitel and Steinbuhler, 2001)
- Integrity –ensure that the information sent or received is correct and has not been altered.
- Exclusivity – deny a third party any possible benefits he may derive from any information that should come into his possession. (Hunter, 2001)
- Non-repudiation – ensure that the true sender should not be able to deny he sent it.
- Authentication - provide the identities of sender and receiver to each other.
- Availability – provide a specified level of service to the user.

Some of the most common techniques available nowadays to ensure security on the Internet are discussed below.

2. Encryption

Typically the channels through which data pass over the Internet are not secure since anyone on the same network can listen in, grab the packets and read the content.

To secure information, data can be encrypted. Encryption is the conversion of data into a form, called a cipher text that cannot be easily understood by unauthorized people. Decryption is the process of converting encrypted data back into its original form so it can be understood. (TechTarget.com Inc, 2001d)

The use of encryption and decryption is as old as the art of communication. Simple ciphers can include the substitution of letters for numbers or the rotation of letters in the alphabet. More complex ciphers work according to sophisticated computer algorithms that rearrange the data bits in digital signals. (TechTarget.com Inc, 2001d)

Encryption is useful to assure privacy, integrity, exclusivity, non-repudiation and authentication. Encryption can be symmetric or asymmetric. Symmetric encryption uses the same key for both encryption and decryption. The algorithm used to perform the encryption may be well known. This process is popular in military applications. The drawback is that physical keys need to be distributed. Within a big organization it is possible to physically distribute them by some secure channel, usually a courier. This process is vulnerable to compromise if the courier is compromised. A bigger problem arises when someone need to communicate securely with somebody never met before in another organization.

For EC, this method would not work. Imagine how to contact Amazon.com to buy books. Couriers are impractical and keys cannot be sent by e-mail and a person still needs to send the credit card number via the net.

The problem can be solved by asymmetric encryption. In this approach, two completely separate keys are used: one to encrypt the message and another to decrypt it. This system turns out to be very powerful, and is the basis for much of the crypto infrastructure on the net today. This type requires that a company publish its public key for the entire world. If someone wants to send e-mail for a company, he or she looks up the company's public key and encrypt the message using the key. The company decrypts the message using its private key.

In practice, asymmetric encryption systems are slow compared to symmetric key crypto systems, leading to hybrid systems: a public key system is used to distribute a "session key", a secret symmetric encryption key. The symmetric is used for the bulk of communications and the public key crypto is used to solve the key distribution problem. (Mc Gregor, 2001)

The stronger the cipher, that is, the harder it is for unauthorized people to break it, the better, in general. However, as the strength of encryption increases so do costs.

Maintaining the secrecy of private keys is crucial to keeping a cryptographic system secure. Most compromises in security result from poor key management, or the mishandling of private keys which results in key theft, for example, rather than an attempt to decipher the keys. (RSA Laboratories, 2001) As an example, the Soviets, through sloppy crypto procedures, had a crypto failure during 1941-44. The U.S. exploited this to roll up Soviet agents over the next fifteen years.

A question raised after the terrorist attack of September 11th in the United States whether the encryption technology, created to enable reliable EC and safe and secure Internet e-mail contacts, had helped terrorists coordinate the attacks in New York and Washington. (The Monterey County Herald Newspaper, 2001)

The government of the United States is in the process of selecting a new, more secure standard for symmetric encryption to replace the Data Encryption Standard that has been the standard set by the U.S. government. The new standard will be called the Advanced Encryption Standard (AES) and will be selected based on strength, efficiency, speed and a few other characteristics. (Harrison, 2000b)

3. Digital Signature

Digital signatures, the electronic equivalent of written signatures, use public-key cryptography to solve the problem of authentication and integrity. It is an electronic signature that can be used to authenticate the identity of the sender of a message or the signer of a document, and possibly to ensure that the original content of the message or document that has been sent is unchanged. (TechTarget.com Inc, 2001e)

Digital signatures are easily transportable, cannot be imitated by someone else, and can be automatically time-stamped. To create a digital signature, a sender first takes

the original plaintext message and runs it through a hash function, which is a mathematical calculation that gives the message a hash value. (Deitel and Steinbuhler, 2001) For example, a person could take the plaintext message "Buy 100 shares of company X," run it through a hash function and get a hash value of 42. The hash function could be as simple as adding up all the 1s in a message, though it is usually more complex.

A digital signature can be used with any kind of message, whether it is encrypted or not, simply so that the receiver can be sure of the sender's identity and that the message arrived intact. A digital certificate contains the digital signature of the certificate-issuing authority so that anyone can verify that the certificate is real.

A fundamental difference between digital signatures and handwritten signatures is that the first is created using the contents of the document or a person's digital signature is unique for each document he or she signs, whereas the latter is independent of the document being signed.

The U.S. government recently passed digital-signature legislation that grants digital signatures over the Internet the same legal force and effect as a traditional signature. (Information Technology Association of America, 2000)

Digital signatures do not provide proof that a message has been sent. The non-repudiation problem can be solved by the use of time stamping, which binds a time and date to a digital document. This process requires a third party, called a time stamping agency, to affix the date and time of receipt.

4. Public Key Infrastructure

A PKI (public key infrastructure) enables users of a basically insecure public network such as the Internet to securely and privately exchange data and money through the use of a public and a private cryptographic key pair that is obtained and shared through a trusted authority. The public key infrastructure provides for a digital certificate that can identify an individual or an organization and directory services that can store and, when necessary, revoke the certificates. Although the components of a PKI are generally understood, a number of different vendor approaches and services are

emerging. Meanwhile, an Internet standard for PKI is being worked on. (RSA Security Inc., 1999)

5. Firewalls

A firewall is a set of related programs, located at a network gateway server that protects the resources of a private network from users from other networks. Thus, firewall software controls access to a network and enforces a security policy by means of a pair of mechanisms: one to block traffic, and one to permit traffic and access to network data. (TechTarget.com Inc, 2001)

A firewall is effective when it is integrated within an organization's overall security architecture, neither protecting against intruders nor from hackers who operate from within the organization and employees who go home with sensitive data on their laptop or a disk in their briefcase.

It is estimated that 70 to 90 percent of attacks on corporate networks are internal. (Gaudin, 2000) To solve the problem with the Intranets, Kerberos employs symmetric secret-key cryptography to authenticate users and to maintain the integrity and privacy of network communications.

6. Biometrics

Biometric authentication systems take advantage of an individual's unique physical characteristics in order to authenticate that person's identity. Various forms of biometric authentication include face, voice, eye, hand, signature, and fingerprints. (Ankari Inc., 2001)

Fingerprints and other biometric devices consist of a reader or scanning device, software that converts the scanned information into digital form, and compares it with databases. In converting the biometric input, the software identifies specific points of data as match points. The match points are processed using an algorithm into a value that can be compared with biometric data scanned when a user tries to gain access. (TechTarget.com Inc, 2001f) Besides fingerprints, voice patterns, face measurement, and retina and iris measurements are considered viable approaches.

Currently, passwords are the predominant means of authentication, but biometrics is replacing passwords as its prices are decreasing. Help centers spend a lot of time in

solving problems with customers that have trouble with passwords. Passwords can be forgotten or stolen as a password to access your e-mail, to withdraw money at an ATM, and sometimes for cars and doors is sometimes needed. Another disadvantage is that passwords need to be replaced continually to increase security, making the problem even bigger.

Microsoft recently announced that it will include the Biometric Application Programming Interface (BAPI) in future versions of Windows, which will make it possible for companies to integrate biometrics into their systems. (Deckmyn, 2001)

7. Passwords

A password is a sequence of characters used to determine that a computer user requesting access to a computer system is really that particular user. Typically, users of a multi-user or securely protected single-user system claim a unique name, often called a user ID, which can be generally known. In order to verify that someone entering that user ID really is that person, a second identification, the password, known only to that person and to the system itself, is entered by the user. (Bergen County Technology Center, 2001)

The target when choosing a password is to make it as difficult as possible for an attacker to second-guess what you have chosen. This forces the attacker to try every possible character, letters, numbers, punctuation and control characters in an effort to discourage a person from trying.

Good criteria when choosing a password or setting up password guidelines (Hunter, 2001) include the following:

- Do not use your login name in any form (as-is, reversed, capitalized, doubled)
- Do not use your own name, or any part of it
- Do not use a password of all digits, or all the same letter
- Do not pick a password that someone can easily guess if they know who you are (for example, not your Social Security number, birthday, or maiden name)
- Do not pick a word that can be found in the dictionary (English or foreign language) since there are programs that can rapidly try every word in the dictionary
- Do not pick a password that is similar to your previous password

- Pick a mixture of letters and at least one number
- Choose a password containing both upper and lower case Do choose a password with non-alphabetical characters (digits or punctuation, for example)
- Choose a password that is easy to remember so that you do not need to write it down

It is important that the personnel working in the IT departments of the military organizations continually show the importance of selecting secure passwords that cannot be easily guessed. Training is important and a useful technique that has been required is that a person changes his or her password on some periodic basis to increase security.

8. Security Attacks

Virtual crimes are increasing worldwide and becoming routine news in magazines and newspapers.

Viruses, worms and denial-of-service attacks have cost companies billions of dollars. Just as a virus can infect human organs, a computer virus can infect programs and databases.

a. Viruses

Viruses are computer programs that attach to or overwrite other programs to replicate themselves. Virus can be harmless when the person creates it to show off for their peers, but they can also be used with the intent of causing property damage by corrupting files or even wiping out the hard drive.

There are three primary sources of computer viruses: the Internet, diskettes and computer networks.

An example of the potential damage would be the loss, by Visa, of the records of accounts receivables.

Estimates for the damage caused by the ILOVEYOU virus were as high as $10 billion to $15 billion, with the majority of the damage done in just a few hours. (Deitel and Steinbuhler, 2001)

b. Worm

A worm is similar to virus, but it is a program that can propagate itself using communication services. They do not need to be attached to another program to

spread. In 2001, a worm named Code Red has been exploiting a security hole, primarily in Microsoft Internet Information Server (IIS), to spread. When it infects a server it starts to scan for other vulnerable servers and infects them. During a certain period of time the worm only spreads, then it initiates a Denial-of-Service attack. (F-Secure Co., 2001)

c. Denial-of-Service Attacks

Denial-of-service attacks typically occur when a network's resources are flooded with data packets, leaving the network unavailable for legitimate users. The attacks usually require the power of a network of computers working simultaneously.

In February 2000, distributed denial-of–service attacks shut down a number of high-tech Web sites, including Yahoo, eBay, CNN Interactive and Amazon because a hacker used a network of computers to flood the Web sites with traffic that overwhelmed the site's computers. (Deitel and Steinbuhler, 2001)

Although denial-of–service attacks merely shut off access to a Web site and do not affect the victim's data, they can be extremely costly, as shown in an attack to eBay's Web site on August 6, 1999, that last for a 24-hour period, causing its stock value to plummet dramatically. (Lyons, 2000)

d. Logic Bomb

Another type of threatening program is known as a logic bomb (or sleeper) that is planted in a system where it lies dormant until the occurrence of a specific event or the coincidence of a number of circumstances.

e. Web Defacing

Web defacing is a popular form of attack by hackers, wherein they illegally enter an organization's Web site and change the contents. In February 2000, a hacker got into the web server for the Office of Human Resources at the NASA Goddard Space Flight Center in Greenbelt, Maryland, and defaced its Internet web page. This resulted in labor costs to rebuild the computer system and kept the web server out of service for almost a month. (NASA Office of Inspector General, 2001)

f. Trojan Horse Virus

A Trojan horse virus is a malicious program that hides within a friendly program or simulates the identity of a legitimate program or feature, while actually causing damage to the computer network in the background.

g. Attacks On Servers

The US National Infrastructure Protection Center (NIPC) has been coordinating investigations into a series of organized hacker activities specifically targeting US computer systems associated with EC or e-banking. (2000)

The investigations have disclosed several organized hacker groups from Eastern Europe, specifically Russia and the Ukraine, that have penetrated U.S. EC computer systems by exploiting vulnerabilities in unpatched Microsoft Windows NT operating systems.

Once the hackers gain access, they download proprietary information, customer databases, and credit card information. The hackers subsequently contact the victim company through facsimile, email, or telephone. After notifying the company of the intrusion and theft of information, the hackers make a veiled extortion threat by offering Internet security services to patch the system against other hackers. They tell the victim that without their services, they cannot guarantee that other hackers will not access the network and post the credit card information and details about the compromise on the Internet. If the victim company is not cooperative in making payments or hiring the group for their security services, the hackers' correspondence with the victim company has become more threatening. Investigators also believe that in some instances the credit card information is being sold to organized crime groups. There has been evidence that the stolen information is at risk whether or not the victim cooperates with the demands of the intruders. To date, more than one million credit card numbers have been stolen. (US FBI, 2001)

D. ELECTRONIC FUNDS TRANSFER

1. Status in Brazil and Korea

Electronic Funds Transfer has been used by the Armed Forces of Brazil and Korea for a long time. In both countries, the use of checks for payments is used in few circumstances, and usually for small expenditures. Anyway, an overview of this method of paying electronically is considered appropriate because its use needs to be integrated with the EC system.

2. Definition

Electronic Funds Transfer (EFT) is a system of transferring money from one bank account directly to another without any paper money changing hands. One of the most widely-used EFT programs is Direct Deposit, in which payroll is deposited straight into an employee's bank account, although EFT refers to any transfer of funds initiated through an electronic terminal, including credit card, ATM, and point-of-sale (POS) transactions. It is used for both credit transfers, such as payroll payments, and for debit transfers, such as mortgage payments. (TechTarget.com Inc, 2001g)

In the United States, the bank processes transactions through the Automated Clearing House (ACH) network, which is the secure transfer system that connects all U.S. financial institutions. For payments, funds are transferred electronically from one bank account to the billing company's bank, usually less than a day after the scheduled payment date. (TechTarget.com Inc, 2001g)

The increasing popularity of EFT for online bill payment is paving the way for a paperless universe where checks, stamps, envelopes, and paper bills are outdated. The benefits of EFT include reduced administrative costs, increased efficiency, simplified bookkeeping, and greater security.

3. Risks Involved

Unfortunately, there are risks in the use of EFT. Considering that often very large dollar amounts are transmitted over EFT networks during a single EFT transmission, an individual could potentially steal large sums of money by fraudulently altering payment instructions. Although it is difficult to obtain accurate statistics on EFT fraud, one could suggest that millions of dollars are lost by companies per year to fraudulent EFT payment instructions. (SANS Institute, 2001)

In order to reduce the risk of fraud, several controls can be incorporated into the EFT processing environment. The integration of these preventive steps into the process will reduce the risk of EFT fraud. Most of the problems that arise with the use of EFT are related to the following facts: (SANS Institute, 2001)

- Failure to secure EFT files located on network servers increases the risk of fraudulent data manipulation

- Allowing an excessive number of individuals to generate EFT files increases the risk of fraud
- Physical access to the EFT diskette increases the risk of fraudulent data manipulation
- Failure to provide physical and logical security surrounding the EFT terminal increases the risk of a keystroke logger attack. This could result in the transmission of fraudulent payment instructions to the financial institution
- Failure to maintain effective logical security for the EFT application could result in fraudulent activity
- Failure to deploy an encrypted link between the organization and the financial institution could result in the loss of data integrity and confidentiality.

4. Suggestions to Implement Effective EFT

In order to minimize risks involved in transactions that involve transmission of thousands and sometimes millions of dollars per year through an EFT application some precautions should be adopted. However, the suggestions should not be considered sufficient to detain the fraud efforts. Some key items to consider when using an EFT application include: (SANS Institute, 2001)

- Maintain passwords to default application IDs in a secure location
- Require dual authorization for the creation and deletion of users
- Require dual authorization for the release of EFT files to the bank
- Ensure timely maintenance of user accounts
- Limit failed login attempts to the application
- Require periodic password changes
- Limit dollar amounts of EFT transmissions
- Limit the number of network operating system users with access to the EFT workstation

E. ON-LINE REVERSE AUCTIONS

1. History of Auctions

According to the Merriam-Webster Electronic Dictionary, an auction is a "sale of property to the highest bidder". The earliest auctions for which we have written records are from Babylon in about 500 B.C. In those auctions, men bid against each other for

women they wished to marry. Roman soldiers used auctions to liquidate the property they took from their vanquished foes. (Schneider and Perry, 2001)

Auctions became common in the 17th century when British organized regular auctions of books and art. (Roll, 2000)

The process evolved and auctions began to make great strides after World War II, when businessmen saw an opportunity to use the auction method as an alternate marketing tool. Accordingly, private auctions boomed in the post war period to sell goods and real estate, raising the reputation of auctions to a higher plane through links to banks, attorneys, accountants, the court system, government agencies, and the public. (Chelekis, 1992)

Many different kinds of auctions exist. The English auction, the most popular, starts from a low price. Bids increase until no bidder is willing to bid higher.

The Dutch auction is the reverse of an English auction in that an auctioneer calls out an initial high price and then lowers the bid successfully until a bidder accepts the current bid. (Chelekis, 1992)

In the First-Price Sealed-Bid Auction model, the highest bidders pay the amount of the highest bid. This is a secret bidding process used commonly by governments in awarding procurement contracts.

There are other types of auctions and vast amount of literature regarding this topic, which will not be discussed since they are not within the scope of this thesis.

2. Definition

An on-line reverse auction is often called a "buyers' auction" because sellers bid against each other to win a buyer's business. In this type of auction resellers bid down the price, bidders bid more than once, and their identities are unknown to one another. This results in dynamic competition and pricing that is closer to true market pricing.

Reverse auctions empower the buyer to find the best deal and they give the participating firms more information by announcing the current low bid. Information reduces the seller's uncertainty and simplifies the bid formulation process. Bid information gives the sellers the opportunity to exploit this information by changing their

bids. (Roll, 2000) With on-line reverse auctions, a firm could save much of the resources it currently devotes to develop complicated bidding strategies. The availability of information and the opportunity to change bids increases competitive pressure. This pressure forces bids downward. Formal negotiations lack this competitive pressure because there is no information about the low bid to force competing bids to decrease.

Reverse auctions force all participant contractors to use the market-competition pricing strategy. Emphasis is on competitive action and reaction to pricing decisions that competitors have made or are expected to make. Contractors using this strategy in relatively homogeneous markets establish prices based on what the competition charges, or what they think the competition is going to charge. (Air Force Institute of Technology, 1999)

3. Current Status in the USA

The Internet has put its own spin on the growth of auctions. Due to the Internet's global reach, total business-to-business auction transactions could reach $1 trillion by 2004, with up to 1 million auctions conducted annually. (eBreviate Inc., 2001)

Currently, less than 1 percent of more than $1 trillion in federal, state and local government transactions in the United States take place online. It is estimated that federal, state and local government organizations combined could save more than $50 billion in procurement costs annually through online auctions.(Wyld, 2000)

It should be noted that the laws and government regulations that apply to ordinary acquisitions also apply to reverse auctions. In the United States, government regulations still exist that prohibit revealing the actual name of the bidders or their companies names during an acquisition process. (Federal Acquisition Regulation System, 2001)

4. Current Status in Brazil and Korea

Today, open auctions in Brazil and Korea are more likely to involve simple, transactional goods and are more typical of business-to-consumer (B2C) or consumer-to consumer (C2C) transactions.

The Korean Government has been studying the implementation of EC. It has already established the EDI system for exchanging electronic documents in contracts with vendors. This study of EDI is the first step in the implementation of EC. The first

agency to buy items online was the Defense Procurement Agency (DPA) with the implementation of the Defense Procurement EDI guideline on July 1, 1999. The DPA opened its web-based homepage, which includes bid announcement, registration bidders, and price data, for procurement in April 2001. The DPA is testing procurement through the web page. The Korean Army, Navy and Air Force are studying EC.

The Brazilian Government has already begun the use of reverse auctions. A law issued in August 2000 defines the types of items that can be bought through reverse auctions. The items need to be defined objectively and only items with specifications usually adopted by the market can be bought using this method. Performance and quality must be precisely defined. Since it is the opposite of other methods of purchasing, the law states that reverse auctions can be used for whatever the price might be in the transaction. The first test of the new method took place in December 2000. Vehicles for official use were bought with a reduction of 21% in relation to the market price. In the second test, cartridges for printers were bought at a price 40% lower than expected.

The Brazilian Government has been using the official Brazilian Bank as the enabler. People from the Armed Forces have been trained to use the method. In Brazil it is expected that the method will be used for diversified types of items. The possibility to use reverse auctions for all types of materials and services, except engineering projects, no matter the price, will stimulate Government agencies to use reverse auctions. Another incentive is the reduced acquisition cycle time compared to other methods in Brazil, which sometimes require months.

5. Reverse Auctions in the Public Sector of the USA

In the United States, the use of reverse auctions by the public sector began in December 1999 through Buyers.Gov, the first government exchange portal operated by the government. Nowadays, the site is used only for agencies that purchase IT commodities. The solution implemented up to the moment in the United States was to contract five companies called “enablers”, who are charged with conducting online reverse auctions for federal agencies.

Public sector procurement takes place in the Business-to-Government, or B2G marketplace, which is different from purchasing in the private sector marketplace, or

Business-to-Business (B2B) marketplace. The government buys not only to obtain goods and services for continuing operations, but the acquisitions must promote multiple socio-economic goals that include the use of small and minority businesses, protect against unfair competition, and promote a sound economy by cultivating the commercial vendor community. (US GSA, 2001)

6. Process

Notwithstanding the existence of many companies performing reverse auctions online, the process used by the government of the United States best illustrates the steps of a reverse auction, since its target is to support the public sector. Similar steps could be used in the Armed forces of Brazil and Korea. The following outlines the reverse auction process used by Buyer.Gov. (US GSA, 2001)

- The buyer, or auction maker at the direction of the buyer, creates a list of items and product specifications and chooses a length of time for the auction to run
- The buyer identifies potential suppliers who will participate in the auction
- The buyer or auction maker conducts pre-award reviews of suppliers, including availability of contracts and schedules, ability to meet specifications and delivery times, quality control, costs, past performance, and issues of responsibility
- This results in the generation of an approved supplier list
- Specifics and terms and conditions of suppliers are identified
- Qualified suppliers are invited to participate in the bidding process
- All suppliers agreeing to participate in the auction are set up for the auction. This includes security and registration setup. Suppliers must respond to the auction maker with their intention to compete.
- The auction is conducted. Suppliers then compete in real time for the purchase order by lowering their prices until the auction is closed.

7. Advantages

Below are the more popular reasons why government agencies are turning to reverse auctions for online procurement: (US GSA, 2001)

- Reverse auctions increase participation in the bid activity and provides access to new suppliers and markets. It is to the government's advantage to have a larger number of qualified bidders to participate in the event when there is a perceived lack of competition or few bidders. Online auctions are small-business friendly. Suppliers need only have access to a

browser to participate, thus being able to compete in acquisitions in which they might not have otherwise been invited to participate.

- Reduced paper-based steps and errors. By automating the procurement process, online auctions result in a reduction of paper based processes and error-prone manual activities that were once necessary in the traditional procurement model.
- Competition is documented in an automated environment. The entire bidding history for an auction is captured in a report by the enabler, and provides the procurement officer with valuable information that can be used as market intelligence for future auctions.
- Reverse auctions promote reduced acquisition cycle time through the rapid bid, re-bid and negotiation process done in real-time over the Internet. With reverse auctions, agencies can receive competitive bids from suppliers in the matter of minutes instead of days or weeks.
- Reverse auctions increase the competition among vendors, resulting in lower prices for the government. Gone are the days when only three suppliers were asked for a quote which essentially became "set in stone" as part of the procurement process.
- Reverse auctions increase transparency in the procurement process because prior to auction all the bidders and suppliers are provided common information using the Internet.
- Reverse auctions reduce transaction cost associated with procurement by 60% to 70%, since the procurement function represents a large portion of the federal Government's business operations.

8. Issues

When considering the implementation of reverse auctions, the following problems and advantages need to be considered:

- Reverse auctions are most efficient for high dollar, well-defined purchases. Online reverse auctions require time investments for set-up, and administrative fees. It is most cost-effective to use when purchasing large quantities of an item for which clear product specifications can be created. (US GSA, 2001)
- Suppliers are sometimes averse to participating in reverse auctions. The culture of the organization needs to evolve to incorporate the new method of selling goods and services.
- Online auction technology can be configured to work with existing legacy systems. (US GSA, 2001)
- Reverse auctions are not appropriate for all acquisitions. For example, it might not be appropriate for the acquisition of a complex systems integration task. (US GSA, 2001)

- Both the Contracting Officer and bidders should be provided training by the auction enabler before the start of the auction.
- Separation of the specification into "lots" or logical groupings of items to be acquired. For example, one lot might be desktops PCs, another laptops or printers. This could result in multiple contract awards. (US GSA, 2001)
- The Contracting Officer must establish the rules of the auction prior to the auction event. The rules consist of setting the time and date of the auction, establishing the minimum bid decrements, establishing the currency for the offering of bids, and establishing the rules for overtimes (when a bid is received within the last minute of an auction). Consider using language in the solicitation that permits the purchase of additional quantities of 10% to 20 % at the final auction price. It is important to keep in mind that the reseller is under no obligation to sell additional units at the auction price. (US GSA, 2001)
- Today, price-only auctions are typical, but total cost auctions are the wave of the future. Total cost functionality enables buyers or sellers to more formally indicate which non-price factors are important. They enable a buyer, for example, to incorporate purchase criteria into their negotiations, including warranty, quality, delivery time, customer service and the cost of changing vendors. The auction reflects more of the variable factors used to make a true purchase decision. Taking multiple factors into account helps find the suppliers who will best meet their needs. (Chelekis, 1992)

9. Enablers

Many of the commercial-off-shelf online auction software industry partners, such as FreeMarkets, Frictionless Commerce and SupplierMarket.com provide software and a package of auction services to simplify the development processes of online auctions. In addition to specific online auction vendor offerings, the E-Procurement solution industry partners including Ariba, Commerce One, Oracle and others are now integrating online auction capabilities into their product offerings.

a. Examples of Success in the Public Sector

(1) Defense Finance and Accounting Service (DFAS). On September 20, 2000, the Defense Finance and Accounting Service (DFAS) completed the largest online auction in the history of e-Government. Items were sold in four different lots: 6,200 desktops, 200 laptops, 744 light and 729 heavy-duty printers. DFSA paid $ 2.2 million less than the $ 10 million Independent Government Cost estimate (ICGE). (US GSA, 2001). The results are shown in the Table 6:

Item	Qty	Starting Price	Ending Price	Unit Price	Price Change
Lot 1 (500 MHz Laptops)	200	$ 447,000	$ 360,000	$ 1,800	19 %
Lot 2 (667 MHz Desktops)	6122	$ 6,801,045	$ 5,997,000	$ 980	12%
Lot 3 (16 ppm Printers)	744	$ 1,250,666	$ 649,000	$ 872	48%
Lot 4 (244 ppm Printers)	729	$ 1,240,000	$ 637,000	$ 874	48%

Table 6. Results of the DFSA Reverse Auctions.
(From: US GSA, 2001)

(2) United States Coast Guard. On November 16, 2000, the U.S. Coast Guard conducted an online reverse auction for HU-25, Falcon Jet spare parts. Taken as a whole, the reverse auction resulted in an overall 22% price reduction, representing approximately $300,000 from the historically paid prices for these spare parts. (US GSA, 2001)

(3) Air Force. On March 31, 2001, the MacDill Air Force Base conducted a private reverse auction for the procurement of IT equipment. Five bidders participated in this event that lasted just over 30 minutes. Savings represented 15% from the best government estimate on a $ 970,000 auction. (US GSA, 2001)

(4) Navy. The Naval Supply Systems Command (NAVSUP), Mechanicsburg, Pennsylvania, conducted the first on-line reverse auction in the Federal government on Friday, May 5, 2000, in which companies competed online for a federal contract to buy ejection seats for the B-1, F-15, and F-117 aircraft. Using secured Internet-based technology, bidders were allowed to compete in real time for the contract by lowering their prices as they saw other suppliers' offers. In this instance, the Navy achieved savings of 28.9% over the historical price for these items. The auction lasted 51 minutes, and the contract was awarded within an hour of the reverse auction closing. In contrast, standard procurement contracts are awarded on the basis of written sealed bids or competitive proposals that can take weeks. (Seffers, 2001)

10. Future Vision

Reverse auctions are expected to expand rapidly, following a pattern of exponential growth similar to B2B electronic commerce in general. 13% of U.S. companies are expected to use reverse auctions by 2004, as shown in Figure 8. (eBreviate Inc., 2001)

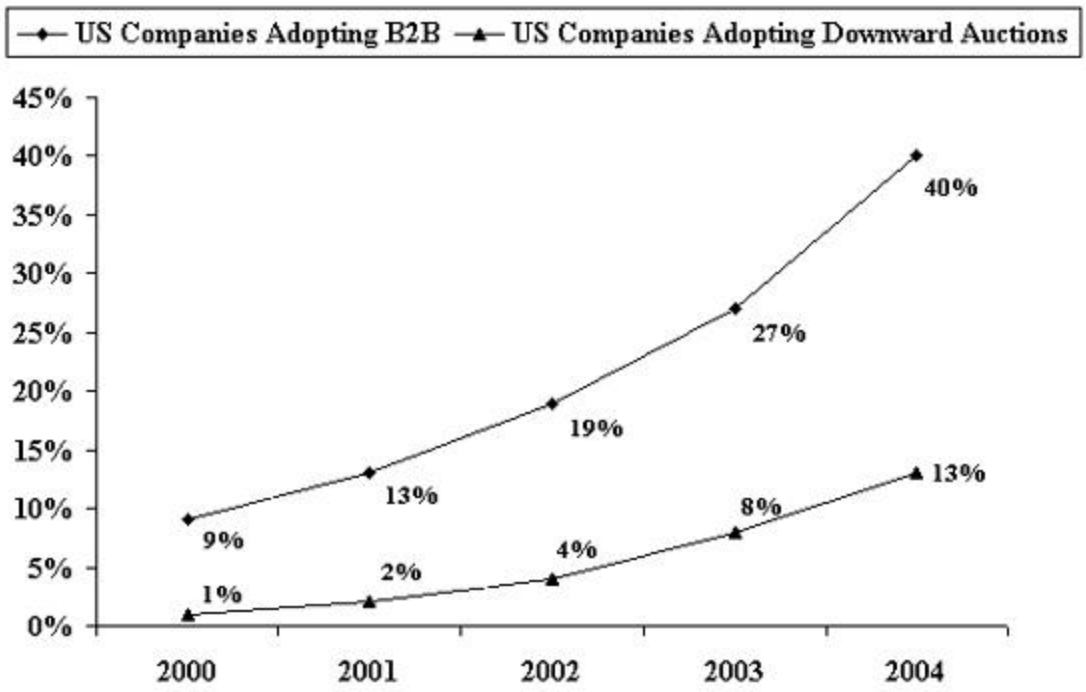

Figure 8. U.S. Companies Adopting B2B and Downward Auctions.
(From: eBreviate Inc., 2001)

Buyers and suppliers have been using reverse auctions only on an occasional basis. As exchanges become established, buyers and suppliers are expected to participate in exchanges on a transaction-by-transaction basis.

It is possible that in the future the Government might decide to provide all the structure required, and thus avoiding using the contractors (enablers) that are still working today.

F. THE FUTURE OF EC

When talking about EC, keep in mind that most of the people who control the greatest percentage of purchasing power are not likely to use computers because of their

age. This situation tends to change as purchasing power shifts to generations familiar with the use of computers.

For both consumers and businesses, the future of EC will depend on its ability to deliver to buyers what they need, preferably better than the old-fashioned marketplace does. (Leebaert, 1998)

1. Intelligent Agents

When a person searches for an item nowadays, usually the search engine produces a list of thousands of home pages, typically ranked according to the frequency of appearance of the key words or by the amount of money given to the administrator of search engines to put the pages in a particular sequence. Sorting out this volume of information discourage Internet users.

The near future will increase the ability of the Internet to provide relevant information through the use of Intelligent Agents (IA). Today, some modern search engines are capable of analyzing the text of search results obtained by a keyword search in order to ensure that the information is relevant to the needs of the user. This is done by using various degrees of natural language processing to ensure contextual relevance. Another technique contributing to relevance is the "profiling" of users, consisting of contextual delimiters supplied by the user. (Leebaert, 1998) Notwithstanding the progress achieved, it is fair to say that the agents used thus far are relatively limited in scope and capability.

An evolution of an Intelligent Agent is one that has natural language capability and user interfaces superior to those used thus far.

By limiting the use of the Intelligent Agent to a narrow domain of a specific application, it is possible to improve the efficiency of linguistic processing. Combining less-than-perfect recognition of speech transmitted over noisy channels with natural language processing will enable users to communicate with the IA by voice in ordinary English. An IA will also generate relevant text, following the completion of a search and other necessary tasks, in order to inform its user to carry out transactions within a range pre-authorized by the user. (Leebaert, 1998)

One of the key advances incorporated in any future IA will be the ability to go beyond information retrieval to "computational enhancement" of information leading to a recommendation or action. Thus, the computational enhancement of information will generally involve three steps: input preparation, when raw information is processed in order to obtain the necessary input parameters in the form required by the available computational algorithms; computational enhancement of information, where the IA carries out computations based on algorithms appropriate to the specific application in order to obtain an improved characterization of a system in terms of appropriate state variables and evaluating outcomes of "what if" questions and compiling results suitable for decision making; and decision making, when the IA may be allowed to make a decision based on the preceding computational results, and it may initiate appropriate action through interaction with other agents or by entering an order for a transaction. (Leebaert, 1998)

An Intelligent Agent used for contracting can be designed to interpret a set of requirements, prepare a regulation-compliant request for proposal (RFP), identify potential supply sources, and conduct market surveys. Further, these agents can move to potential suppliers' locations and collaborate with supplier agents to prepare responsive proposals, and then return to the contracting office, summarize the various proposals or quotations received, and make a preliminary source-selection recommendation. (Nissen, 1999)

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V. IMPLEMENTING EC

A. ORGANIZATION'S STRUCTURE AND RESPONSIBILITIES

1. Structure

Implementing EC would not require the creation of new organizations. The mission of some organizations would be redefined in order to incorporate the new mission. In both Brazil and South Korea, military agencies subordinated to the Ministry of Defense and the Ministry of National Defense, respectively, should be responsible for providing the required structure. These organizations would have to work together with other federal organizations if the purpose is to implement the EC structure as a federal base.

2. Mission

The mission of these organizations would be to serve as the executive agent for accelerating the application of EC practices and associated IT to improve the acquisition processes, supporting life cycle sustainment, and other business operations. The EC project is complex and is expected to involve continuous changes as technology evolves. The roles suggested above are not comprehensive, since it would be difficult to list all pertinent functions. For the first version, the organizations' roles would be:

- Prepare the EC Strategic Plan
- Oversee the development and updates of the Implementation Plan
- Lead technical architecture
- Coordinate standards
- Lead development of technical solutions and alternatives, such as firewalls, PKI, and protocols
- Conduct testing
- Provide technical cross-functional integration
- Serve as the major point of contact with the private sector, contractors, and government agencies for EC-wide policy matters
- Facilitate and support the military organizations' efforts to implement EC consistent with the strategic goals and objectives
- Identify best business practices

- Promote and promulgate the application of EC principles and practices based on generally accepted commercial practices
- Participate in national, international, and interdepartmental boards, committees, and other organizations involving EC, as necessary

B. LEGAL CONSIDERATIONS IN DESIGNING AND IMPLEMENTING EC

Government procurement processes are regulated by law. Over time, agencies have developed processes to respond to obligations and practices imposed by these responsibilities. Therefore, agencies should be aware of the legal implications of converting or re-engineering existing processes and the legal changes that can occur in the move from traditional to electronic processes.

1. Legal Issues to Consider in "Going Paperless"

As an agency identifies processes for conversion from paper to electronic, the agency should ask how it should design those processes so as to protect its legal rights and minimize legal risks that may compromise the agency's mission.

In answering these questions, agencies should consider the following four issues: (US Department of Justice, 2001)

- Will the electronically gathered and stored information be collected, retained, and accessible whenever needed?
- Will the electronic collection, transmission, or storage of "documents" or information comply with applicable legal requirements, including, for example, laws requiring that certain records be maintained in a particular form or format?
- Will electronic records be sufficiently reliable to be useful to Congress, agency decision-makers, private disputants, judges, juries, and others who must determine the facts underlying agency actions?
- Will the agency's use of electronic methods to obtain, send, disclose and store information comply with applicable laws, such as those governing record keeping, privacy, confidentiality, and accessibility?

2. Reducing the Legal Risks in "Going Paperless"

Before attempting to make an agency process paperless, agencies should analyze whether total conversion would be appropriate for each process. Even if parts of an agency function are converted to an electronic process, an agency should consider whether some paper documents should still be used. If an agency concludes that the

electronic use for a particular type of transaction or process is not practicable, the agency is not required to use electronic processes.

The conversion to electronic processes need not be an "all or nothing" proposition. An agency may conclude that it is appropriate to convert most of its processes, while continuing to use paper, at least for the time being, for one particular part of its process. This reflects the common-sense recognition that, for some important transactions, retaining a paper document might be the best, most certain, and easiest to prove medium for establishing a legally significant transaction or event.

In considering whether an agency function or type of transaction should be converted to an electronic process, and, if so, how that process should be designed, agencies can take the following steps: (US Department of Justice, 2001)

- Conduct an analysis of the nature of a transaction or process to determine the level of protection needed and the level of risk that can be tolerated
- Consider potential costs, quantifiable and not quantifiable, direct and indirect, in performing a cost/benefit analysis
- Use available sources of expertise, such as legal, and technical experts, inside and outside the agency
- Consider developing a comprehensive plan when converting a traditional process to an electronic one, especially if converting means re-engineering the existing process
- Consider the kinds of information relevant to the process and ensure that the necessary information is gathered
- Consider using a "terms and conditions" agreement with the other agencies
- Incorporate an appropriate retention and access policy for the records produced by electronic processes, including long-term retention where necessary
- Be aware of legal concerns that implicate the effectiveness of or impose restrictions on electronic data or records
- Just as should be done with paper processes, document the various steps in your electronic process so that you can demonstrate the reliability of your process to courts and others who must determine the facts underlying an agency action
- Analyze the full range of technological options and follow commercial trends where appropriate

- If an agency considers using an outside entity to manage information, the agency should consider the various liability and privacy issues that may arise as a result of this system
- Retain paper-based information in important or sensitive contexts where necessary

C. BASIC PLAN

1. Pilot Program

Implementing EC will require a transition period in which the traditional procurement system will be used with the EC project simultaneously. It will be necessary to invest in reengineering and in studying the types of materials suited to be acquired through EC. These can be different for Brazil and South Korea.

Some organizations should be selected to participate in a pilot program to test its suitability. In fact, the traditional system will continue to exist, since it is not possible to use EC for all kinds of acquisitions. A detailed strategic plan will be necessary to implement the EC project.

2. Budget

In the first two years, it is expected that the implementation costs will be greater than the savings achieved. As occurs whenever an innovation occurs, resistance is expected. It will be necessary to promote cultural changes and allocate part of the annual budget for the project. In order to obtain funding for most EC unique requirements, military organizations will be required to plan and program their budgets in accordance with the existing rules. Investments will be required in hardware, software, training, and research and development. An option to be taken into consideration is outsourcing some required functions.

3. Training

Critical to the attainment of the Brazilian and South Korean EC goals and objectives is its ability to bring about the cultural changes necessary to transition from primarily paper-based business practices to an environment that employs EC across its operations.

An organization subordinated to the Ministry of Defense and the Ministry of National Defense of both Brazil and South Korea, respectively, must be assigned the responsibility of the training functions required. The training effort includes

dissemination of basic information about EC and up-to-date information about delivering technology or new systems that take advantage of new technology or reengineering business processes. Services and products include:

- Updating and maintaining EC information in all schools responsible to prepare personnel that works with procurement
- Creating, updating and maintaining the EC Handbook
- Providing acquisition desktop guidance
- Publishing EC documents to disseminate basic information and educational material to the EC community
- Gathering feedback from users and industry
- Ensuring that educational material being disseminated includes changes based on feedback

D. OUTCOME MEASUREMENT

1. Purpose

Measuring performance involves determining the current level of performance, defining a desired state, and identifying what will indicate progress toward the desired state. In order to fulfill this objective, it becomes necessary to identify the appropriate metrics that best reflect the effectiveness of the EC efforts.

If the Armed Forces from Brazil and South Korea decide to implement EC in their respective procurement system, new measures and systems will need to be developed to both collect and present performance information since the existing ones no longer would provide the diagnostic of the effectiveness of the military organizations involved in the acquisition process.

Performance measurement is defined as a carefully selected set of measures derived from the drivers of business success that represent a tool for leaders to use in communicating strategic direction to the organization, evaluating the status and effectiveness of programs, and motivating change. (USA DoD Assistant Secretary of Defense, 2001)

Without the feedback of performance measurement, there is no way to evaluate planned versus actual outcomes and adjust activities to meet the strategic objectives.

2. Parameters

A number of approaches, which are not within the scope of this thesis, have been developed to help evaluate the progress and success of projects, such as balanced scorecards and measurement survey questionnaires.

The parameters suggested to verify if the proposed EC is providing the desired results include:

- The "AS-IS" level of performance before the implementation of the EC project
- The current level of performance achieved by the project effort
- A benchmark, which is the level of performance observed from studies of best practices
- The goal for the desired level of performance frequently based on benchmarks
- The threshold which is the level of performance below which the project is no longer achieving acceptable results

3. Goals of the EC Project

The outcomes measured need to be related to the goals pursued. The major objectives of the suggested EC project include:

- Improve timeliness, accuracy, and effectiveness of management information
- Reduce acquisition costs
- Decrease administrative lead time
- Build clear acquisition procedures by furthering information disclosure and upgrading fair decision-making processes to win the public's trust
- Elimination of labor intensive processes, duplicate data entry, and paper-handling tasks, enabling procurement employees to focus on functional tasks requiring judgment and experience
- Improve readiness from improved availability of supplies
- Decrease training requirements and costs due to standard user interface
- Optimize, streamline, and integrate disparate procurement systems, subsystems, and databases
- Provide for improved data integrity by electronic input of selected data to a logically shared data repository. The capability to exchange data within the Armed Forces organizations, other government agencies, and with industry must be provided

- Provide for the use of EC and Electronic Data Interchange among the defense organizations and with those outside these organizations
- Streamline manual management processes, including the automation of manual management activities and the ability to input data only once at the source
- Provide an on-line means for capturing and evaluating feedback information from users both inside and outside the organizations
- Provide the status of materials that are on order or on hand in a near-real-time environment to enable the Armed Forces to more closely monitor its assets
- Enhance capture of up-to-date accurate information resulting in more efficient management of contracts, which leads to decreased penalties and interest for late government payments

4. Periodicity

Comparison with the traditional method of procurement is necessary to establish concrete targets and threshold values.

The measurement process is continuous and should always be updated. In the beginning of the implementation, reevaluation could be done quarterly. It is important to ensure that the set of performance measures selected is measuring the correct factors, disseminating the targets and the evaluation system, and establishing information collection efforts to obtain periodic data.

One method of demonstrating that a program is on track at a particular point in time is to compare the current estimates of the components (cost, schedule, and benefit) against the target and threshold values. Current estimates that exceed the threshold value indicate a breach condition where corrective action is warranted. Current estimates between the target and threshold indicate a warning condition that performance is not at the desired level, and steps should be taken to ensure that the values do not extend below the threshold.

5. Suggested Measures

The following measures could be used as a first step in evaluating the success of implementing the EC project:

- Decreased administrative lead time
- Correct response to requests for information

- Response time of the IT system
- User-friendly design based on surveys
- Protection from unauthorized access
- Decreased training costs
- Increased readiness from improved availability of supplies
- Reduction in transaction costs
- Decrease in acquisition costs
- Increased user satisfaction
- Return on investment based on savings
- Decreased cost of inventories storage

The next step would be to establish measurements of each of the variables suggested, which is outside the scope of this thesis. A good guideline for establishing a performance measurement is provided in detail in reference 89.

E. RECOMMENDATIONS

In order to implement the structure required for EC, the Brazilian and Korean governments could follow some guidelines used by the Department of Defense of the United States. Since the governments of both countries have been studying the implementation of EC and some actions and pilot programs have been tested, it is possible that some suggestions provided here have already been adopted, considering the dynamic environment in which innovations are implemented nowadays. The implementation of the suggestions provided here does not need to follow the sequence in which they are displayed and can change as new methods and technologies emerge.

To implement EC and to achieve its objectives, the Brazilian Ministry of Defense and Korean Ministry of National Defense should:

- Define the architecture for the government-wide EC acquisition system and identify executive departments or agencies responsible for developing, implementing, operating, and maintaining the electronic system in the Armed Forces
- Invest in telecommunications capability that is efficient, reliable, and capable of accommodating the anticipated increasing volume of EC traffic
- Provide gateways services and network entry points that serve as high-speed telecommunications links with commercially operated VANs, and trading partners and their applications, establishing an Internet

infrastructure to allow a seamless transport capability between established government and commercial networks

- Create a communication and computing infrastructure composed of standard support services with facilities based on the principles of open systems. The infrastructure must provide a way of interchanging standard transactions at a low cost with minimum impact on existing automated systems. Since the government will increasingly be exchanging information electronically with its trading partners, there is a clear need to use open systems based on non-proprietary standards to support extensibility, scalability, portability, and maintainability requirements. (USAID, 2001)
- Integrate business functions, application program interfaces, and databases within the agencies and departments subordinated to the designated leader organization. That integration will ensure that all organizations in the Armed Forces have access to common databases that are government-wide. (US DOD, 2001b)
- Developed an EC system that is flexible, scalable, and extensible to accommodate technology and functional enhancements and improvements. The modules must be capable of existing on platforms of different vendors and support alternative configurations that can be adjusted to provide an EC capability to accommodate operations of varying sizes. Additionally, as EC becomes more prevalent in government, it should allow for other functions such as logistics, personnel, and health, to take advantage of this information infrastructure. (US DOD, 2001b)
- Use established commercial bench-market practices and off-the shelf products whenever effective
- Establish an initial EC capability to enable the government and private suppliers to exchange standardized requests for quotes (RFQ), quotes, purchase orders, and notice of awards
- Implement a system to process electronic payments, document interchange, and supporting databases
- Make available to all agencies electronic catalogs and government contracts. This would enhance competition and provide lower prices. That approach would provide the government ready access to potential sources of supply. A system of online catalogs for the EC system needs to be developed for all sources of supply. These catalogs should be developed and maintained based on a standard method by the responsible agency.
- Make available for suppliers that do business with the government unique identification numbers in situations that occur when one office in a corporation provides quotes and another is responsible for maintenance, or training.

- Integrate the procurement request with the budget in such a way that the system be able to commit the volume of resources required to pay orders sent electronically. In Brazil it is important that the SIAFI (Integrated System of Financial Administration) be integrated with the new EC system proposed. The system must be able to receive invoice information from the supplier electronically, verify receipt of goods and services, and electronically transfer funds to the supplier.
- Establish a single method of identifying vendors and suppliers as well as integrate the stock numbers for products used by more than one agency
- Prepare a system to operate 24 hours a day, 7 days a week, considering that the stream of traffic within the system is not constant
- Consider that it will be necessary to transmit not only simple transactions between partners, but messages, graphics, drawings, and contracts as well
- Process and pass transactions in a secure manner. Without an appropriate level of security and control, EC operation will be unreliable, and losses will be unnecessarily high. Viewed from the standpoint of potential threats, controls should make the cost of obtaining data greater than the potential value of obtaining or modifying the data. There are four requirements for the security of any process that were discussed previously. They include confidentiality, integrity, authentication, and non-repudiation. The requirements can be achieved by the use of much available software. A suggestion is to take into account the use of encryption, firewalls, Public Key Infrastructure, biometrics, digital signatures, and anti-virus software
- Create a Help Desk for assistance and training both insiders (buyers) and outsiders (vendors)
- Centralize the responsibility for some organizations to update and change common or shared functions
- Allow easy access to laws and regulations in an electronic format that is important for the agencies using the system. These can include labor determinations and tax regulations. Responsibility for each existing database should remain with the agency currently charged with that responsibility.
- Create a database with information related to the suppliers including business size, socioeconomic status, name, company, address, situation in relation to public regulations, expiration date of documents required to sell for public organizations, and past performance.
- Review and evaluate the entire financial process relating to the procurement cycle, particularly those currently subject to manual operation. The areas suggested for review include: requisition processing, budget execution (commitment, obligation, adjustment), invoice receipt,

payment processing and disbursement (EFT), and collections, refunds, and credits. (US DOD, 2001b)

- Adopt distributed data, client/server architecture for the EC database and SQL as the database technology
- Promote the use of reverse auctions

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VI. CONCLUSION

Due to budget reductions in the Armed Forces of Brazil and Korea, their organizations can no longer operate as in the past. Information-processing technology is a way to improve operating efficiency and effectiveness within today's funding constraints.

The environment in the beginning of this century is a shift from a culture that organizes and regulates its society around modeling, recording, managing, and maintaining fundamental business processes in paper document form to a culture in which information technologies make information available globally, instantaneously, and inexpensively where and in whatever form individuals need.

The global business community has already embraced the use of EC in order to stay healthy and grow in the competitive marketplace.

The government must keep pace with the private sector to lower costs for the goods and services it buys, eliminate unnecessary layers, streamline processes, and use existing technology to the fullest.

EC only will not provide the necessary improvements. They must look at the value of the old rules and recognize the need to link the various processes of requisitioning, buying, receiving, paying and managing goods and services. The standardization of the EC architecture presents a great opportunity to reengineer an agency's procurement system. That is, the submission and processing of requisitions, the issuance of RFQs, the evaluation of quotations, and the submission of offers all must be reevaluated and streamlined to take advantage of EC.

It is important that the governments of Brazil and Korea move quickly to standardize its move to EC before ad hoc implementations makes progress more difficult.

Standards are critical to the long-term commercial success of EC as they can allow products and services from different buyers and vendors to work together. On the other hand, premature standardization can “lock in” outdated technology. Technology is moving rapidly and the Brazilian and South Korean governments need to balance their

attempts to establish technical standards for its networks with the risk of inhibiting technological innovation.

Small purchases are an area in which substantial and immediate benefits will result from the use of EC since they represent a large proportion of the workload in most buying offices. Automation would allow the buying office to perform more efficiently.

The capacity to entirely capture the benefits of EC can be inhibited by outdated legislation that does not consider its existence, by limited budgets, by agency self-imposed limitations, by the lack of coordination between the government's diverse agencies in the collection and sharing of information, and by the government's delay in acquiring and implementing the use of the latest technologies quickly.

The success of implementing EC will depend on changes that are not under the control of the Armed Forces. Still, the legislative branches of both countries have been studying the impact of EC and many regulations have already been changed.

The benefits of using EC in the acquisition process of the Armed Forces of Brazil and South Korea will be lower prices, increased readiness, better management information, reduced acquisition times, and better inventory control. Its use will eliminate many functions, such as mailing, handling, repetitive data entry, and telephoning, and will improve the efficiency and effectiveness of the procurement process.

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